Compendium of Research in the Northwest Territories

2009-2010

AURORA RESEARCH INSTITUTE

www.nwtresearch.com

This publication is a collaboration between the Aurora Research Institute, the Canadian Department of Fisheries and Oceans, the Department of Environment and Natural Resources, the Government of the Northwest Territories and the Prince of Wales Northern Heritage Centre. Thank you to all who submitted a summary of research or photographs, and helped make this publication possible.

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Fisheries and Oceans Canada   Pêches et Océans Canada

Northwest Territories Environment and Natural Resources

Northwest Territories Education, Culture and Employment

Photo Credit: Joost Van Der Sanden, Natural Resources Canada

Foreword

This *Compendium of Research in the Northwest Territories* is a comprehensive collection of all licenced research conducted in the Northwest Territories (NWT) in 2009 and 2010. The annual Compendium is the result of collaboration between the Aurora Research Institute, the Department of Environment and Natural Resources (ENR), Fisheries and Oceans Canada (DFO) and the Prince of Wales Northern Heritage Centre, who compile a publication about licenced research in the NWT each year. This is intended to provide an overview of all research activities conducted in the territory, along with contact information for researchers that are leading these research programs. It is a useful resource for gathering information on studies conducted across the territory and provides a plain-language summary of research program activities.

These last two years have included significant achievements for science and research in the NWT. In 2009, the Government of the Northwest Territories recognized the importance of science in supporting effective public policy decisions through the publication of the first NWT Science Agenda. This agenda establishes a strategic framework for science in the NWT, and sets a path for the people of the NWT to play a leadership role in the development and management of scientific knowledge. In 2010, we saw the end of the International Polar Year (IPY) field research activities. The increased investment in northern research throughout the IPY program culminated in 2010 with the highest level of licenced research activity in the NWT to date. IPY funded a broad range of studies focused on climate change impacts and adaptation, as well as the health and well-being of northern communities.

The legacy of the IPY research program and the renewed focus on science through the NWT Science Agenda demonstrate that the NWT continues to be a region of significant research activity and discovery.

Pippa Seccombe-Hett
Director, Aurora Research Institute
Aurora College

Table of Contents

INTRODUCTION i

LAND CLAIM REGIONS IN THE NORTHWEST TERRITORIES iii

NORTHWEST TERRITORIES RESEARCH INSTITUTES iv

2009 LICENCED RESEARCH PROJECTS viii

Aurora Research Institute

Scientific Research Licences

- *Biology* 1
- *Contaminants* 17
- *Engineering* 29
- *Health* 33
- *Physical Sciences* 39
- *Social Sciences* 70
- *Traditional Knowledge* 90

Prince of Wales Northern Heritage Centre

Archaeology 99

Fisheries and Oceans Canada

Fisheries Permits 108

Department of Environment and Natural Resources Canada

Wildlife 126

2010 LICENCED RESEARCH PROJECTS 145
Aurora Research Institute
Scientific Research Licences
Biology 146
Contaminants 157
Engineering 168
Health 171
Physical Sciences 182
Social Sciences 228
Traditional Knowledge 248

Prince of Wales Northern Heritage Centre
Archaeology Permits 258

Fisheries and Oceans Canada
Fisheries Permits 270

Department of Environment and Natural Resources
Wildlife 291

GLOSSARY 309

INDEX 315

INDEX 319

Photo Credit: William Hurst, ARI

Introduction

This compendium offers a summary of research licences and permits that were issued in the Northwest Territories during 2009. The information contained in this book is the product of a collaboration between the Aurora Research Institute (ARI), the Prince of Wales Northern Heritage Centre (PWNHC), the Department of Environment and Natural Resources (ENR) and the Department of Fisheries and Oceans (DFO). The Compendium series began in 1986.

Licensing in the NWT

Under territorial legislation, all research in the NWT requires a licence or permit from one of four agencies, depending on the type of research being conducted:

Prince of Wales Northern Heritage Centre – archaeology research;

Department of Environment and Natural Resources, Government of the Northwest Territories – wildlife research;

Department of Fisheries and Oceans – fish and marine mammal research

Aurora Research Institute - all other research in the NWT.

Through the licensing process, researchers are informed of the appropriate organizations, communities and other licensing/permitting agencies that should be contacted prior to conducting studies. Licensing ensures research activities are communicated to interested parties and provides opportunities for the exchange of information.

The compendium provides a summary of all licences and permits issued in the NWT by all four licensing/permitting bodies. As each research project is represented by only a short abstract, the reader is encouraged to contact the researcher for additional information and results.

How to Use This Book

This book has four main sections. Each of these sections reflects a specific licensing agency and the type of licence or permit issued. Within each section, research descriptions have been grouped by subject and listed alphabetically by the principal researcher's last name. Refer to the Table of Contents for the specific page on which each section or subject begins. An index is included at the end of the compendium listing all researchers in each section.

1. File Number

The file numbers shown in each of the Aurora Research Institute's subject areas refer to the file number issued to a particular researcher. It allows cross referencing with research material that may be available on file or in the ARI library. The reference numbers of the other three agencies refer directly to the permit numbers given to each researcher. When requesting information from any of these agencies on specific research outlined in the compendium, please refer to the reference number in your correspondence.

2. Regional Abbreviations

Throughout the book, reference is made to the specific land claim region(s) in which the research took place. The regions are shown on the following page. Some of the land claim regions are still under negotiation and the boundaries shown are only approximations. The abbreviations shown for each region are as follows:

DC	Deh Cho	**SS**	South Slave
NS	North Slave	**SA**	Sahtu Settlement Area
IN	Inuvialuit Settlement Region	**GW**	Gwich'in Settlement Area

3. Glossary

A glossary of terms has been added to the Compendium. The intent of the glossary is to allow the reader to better appreciate the research descriptions.

4. Nomenclature for birds' names

Bird names are capitalized, according to the guidelines of the American Ornithologists' Union Check-list of North American Birds.

5. International Polar Year

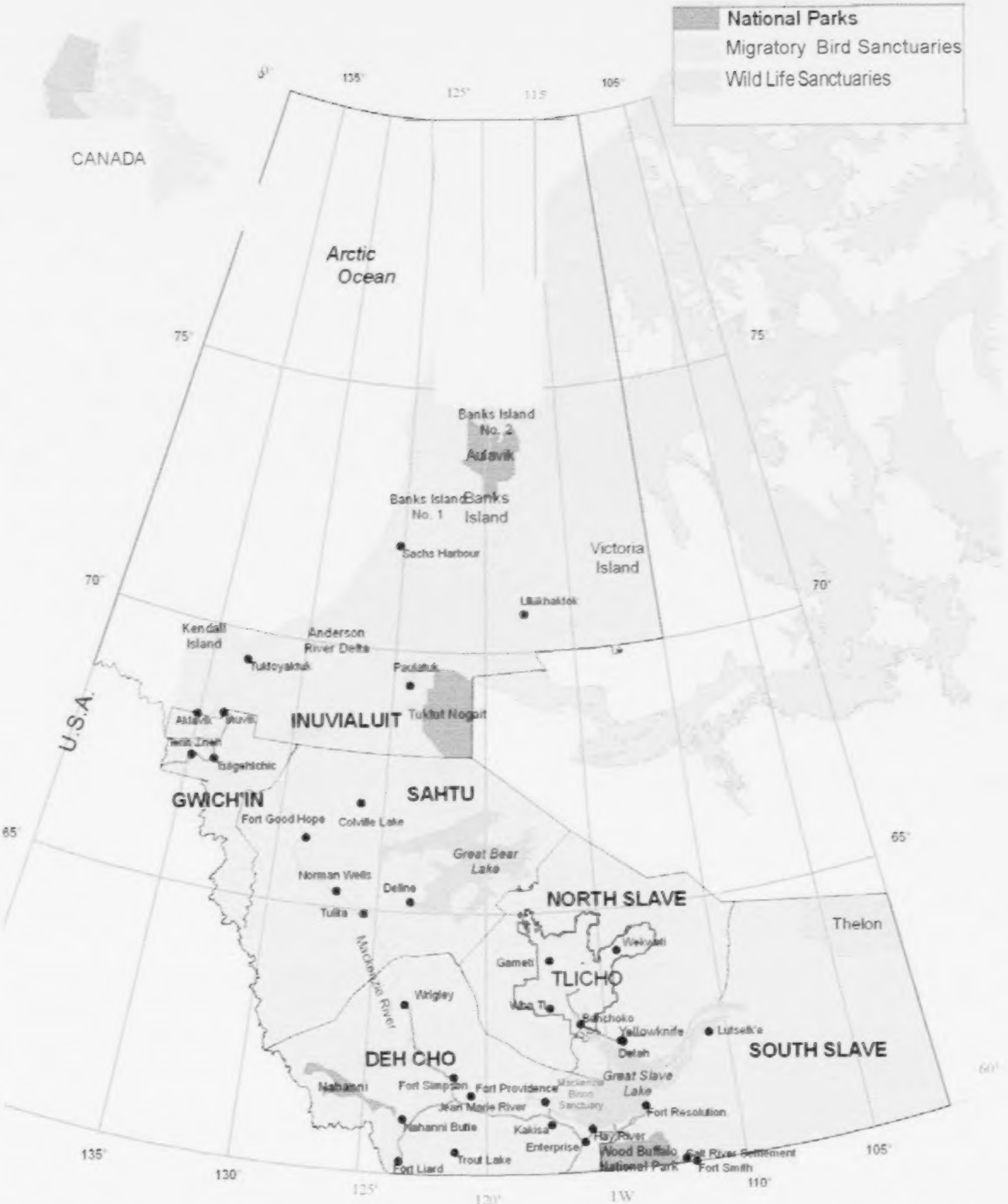
Projects that have received International Polar Year funding in 2008 will be noted by the following symbol: 2007-2008 API·IPY

Available in Print or Free Download

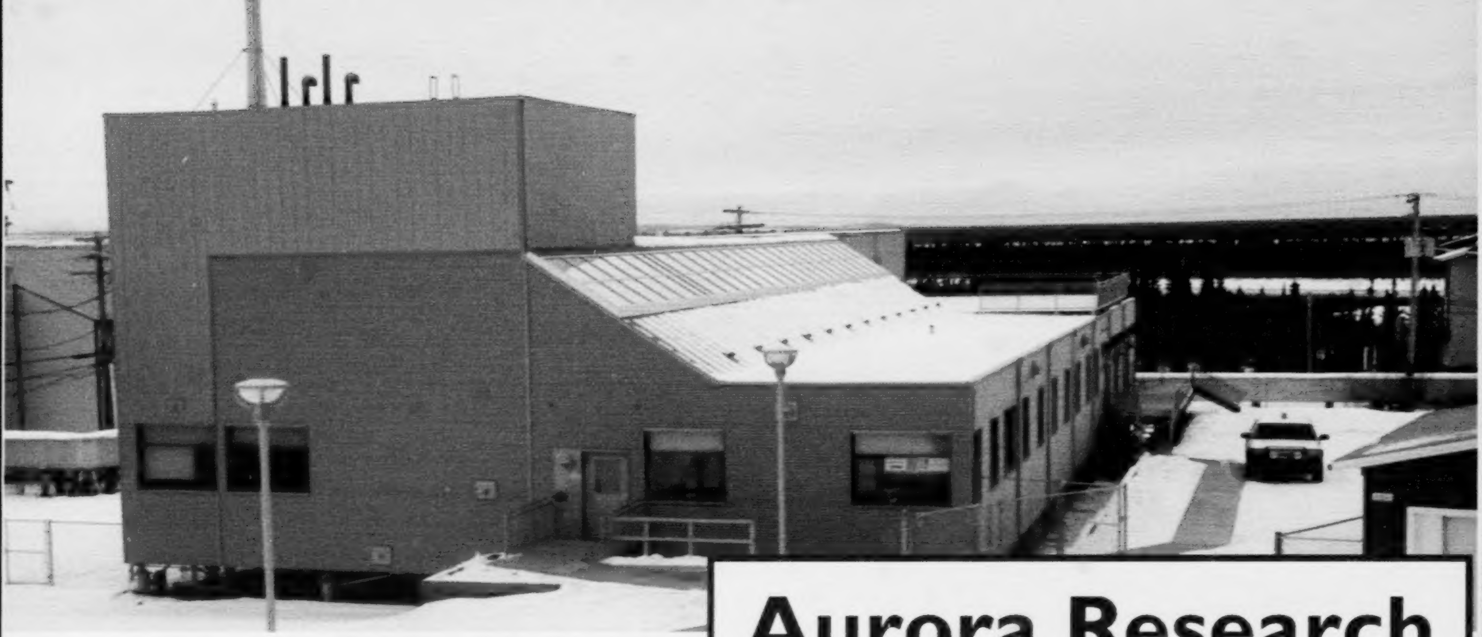
This compendium is available as a printed publication or can be downloaded from the Aurora Research Institute's website (www.nwtresearch.com). Copies can also be requested by contacting the Aurora Research Institute.

Send Us Your Comments

Whether you are a researcher or an interested member of the public, the Aurora Research Institute welcomes your comments and suggestions concerning this publication. Contact us by mail, fax, email or telephone (see address on page VI).


National Parks
Migratory Bird Sanctuaries
Wild Life Sanctuaries
CANADA
U.S.A.
Arctic Ocean
135°
125°
115°
105°
75°
70°
65°
60°
130°
120°
110°
Banks Island No. 2
Aulavik
Banks Island No. 1
Banks Island
Sachs Harbour
Victoria Island
Ulukhaktok
Kendall Island
Anderson River Delta
Tuktoyaktuk
Paulatuk
Aklavik
Inuvik
INUVIALUIT
Tuktut Nogait
Tsiigehtchic
GWICH'IN
SAHTU
Fort Good Hope
Colville Lake
Great Bear Lake
Norman Wells
Deline
Tulita
NORTH SLAVE
Thelon
Wekweeti
Gameti
TLICHO
Wha Ti
Behchoko
Yellowknife
Dettah
Lutselk'e
Mackenzie River
Wrigley
DEH CHO
SOUTH SLAVE
Nahanni
Fort Simpson
Fort Providence
Mackenzie Bison Sanctuary
Great Slave Lake
Jean Marie River
Fort Resolution
Nahanni Butte
Kakisa
Hay River
Enterprise
Wood Buffalo National Park
Salt River Settlement
Fort Smith
Trout Lake
Fort Liard

Land Claim Regions in the Northwest Territories



Aurora Research Institute

The Aurora Research Institute's mandate is to improve the quality of life for NWT residents by applying scientific, technological and indigenous knowledge to solve northern problems and advance social and economic goals.

ARI is responsible for:

- licensing and coordinating research in accordance with the NWT Scientists Act: this covers all disciplines including the physical, social, biological sciences and traditional knowledge;
- promoting communication between researchers and the people of the communities in which they work;
- promoting public awareness of the importance of science, technology and indigenous knowledge;
- fostering a scientific community within the NWT which recognizes and uses the traditional knowledge of northern aboriginal people;
- making scientific and indigenous knowledge available to the people of the NWT;
- supporting or conducting research and technological developments which contribute to the social, cultural and economic prosperity of the people of the NWT.

For more information, contact ARI at:

Aurora Research Institute
PO Box 1450
Inuvik, NT X0E 0T0
Tel: 867-777-3298
Fax: 867-777-4264
E-mail: licence@nwtresearch.com
Website:www.nwtresearch.com

Photo Credit: Donald Ross, ARI

The Department of Environment & Natural Resources

The Government of the Northwest Territories' Department of Environment and Natural Resources (ENR), has a mandate to promote sustainable development through the management and protection of the quality, diversity and abundance of natural resources and the integrity of the environment.

With respect to permitting for research and monitoring, ENR is responsible for issuing Wildlife Research Permits under the Wildlife Act (Section 24) for all studies on wildlife or wildlife habitat in the Northwest Territories. Wildlife includes all vertebrates, except fish and marine mammals.

For more information, contact ENR at:

Wildlife Division
Environment and Natural Resources
Government of the Northwest Territories
PO Box 1320
Yellowknife, NT X1A 2L9
Fax: 867-873-0293
E-mail: wildliferesearch_permit@gov.nt.ca
Website: www.nwtwildlife.com/ResearchPermits/

Northwest Territories Environment and Natural Resources

Photo Credit: William Hurst, ARI

Department of Fisheries and Oceans

The Department of Fisheries and Oceans Canada (DFO) is responsible for developing and implementing policies and programs in support of Canada's scientific, ecological, social and economic interests in oceans and fresh waters. Some Fisheries management responsibilities have been delegated or transferred to other federal agencies (e.g. Parks Canada), provinces/territories and co-management groups under Land Claim agreements.

DFO Fisheries Management is responsible for issuing Commercial, Domestic, Licence to Fish for Scientific Purposes (LFSP), Exploratory, Public Display and Educational licences in the NWT. Subject to Land Claim agreements, a Commercial licence is required to sell or barter fish.

All individuals fishing for scientific purposes or participating in the acts described below are required to obtain a Licence to Fish for Scientific Purposes (LFSP):

- activities involving fishing, catching or attempting to catch fish;
- activities where the potential exists for the incidental capture of fish;
- sampling or possessing fish caught in a subsistence fishery.

For further information about licensing, contact DFO at:

Licensing Officer Central &
Arctic Region Government of
Canada Fisheries and Oceans
Canada PO Box 1871
Inuvik, NT X0E 0T0
Tel: (867) 777-7500 Fax: (867) 777-7501
email: xca-inuvikpermit@dfo-mpo.gc.ca
Website: http://www.dfo-mpo.gc.ca/index-eng.htm

Fisheries and Oceans Canada Pêches et Océans Canada

Photo Credit: Valerie Tomlinson, ARI

Prince of Wales Northern Heritage Centre

The Prince of Wales Northern Heritage Centre (PWNHC), a division of the Department of Education, Culture and Employment, Government of the Northwest Territories, is responsible for managing and protecting the archaeological resources of the NWT. Archaeological sites in the NWT, which contain relics from over 7000 years of continuous occupation in the territory, are fragile and non-renewable. They are protected from disturbance by legislation, regulation and policy in the NWT. There are currently about 6000 archaeological sites recorded in the NWT, though this number represents only a fraction of the existing sites, as large areas remain unexplored for archaeological resources. A large part of the work done at the PWNHC involves reviewing land use and development permit applications. On average, 300 permits are reviewed per year, with recommendations being proffered to nine land management authorities.

With respect to permitting for research and monitoring, PWNHC is responsible for issuing NWT Archaeology Research Permits.

For more information, contact the Prince of Wales Northern Heritage Centre at:

NWT Cultural Places Program
Prince of Wales Northern Heritage Centre
4750 48th Street
PO Box 1320
Yellowknife, NT, X1A 2L9
Phone: 867-873-7551
Fax: 867-873-0205
Email: archaeology@gov.nt.ca
Website: www.pwnhc.ca

Northwest Territories Education, Culture and Employment

2009 Licenced Research Projects

Photo Credits: Joost Van Der Sanden, Natural Resources Canada; Donald Ross, ARI; Valerie Tomlinson, ARI; William Hurst, ARI

Azzolini, Louie
Terra-Firma Consultants C/O Dez Energy Corporation Ltd.
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Louie@Terra-Firma.ca

File No: 12 402 812 **Licence No:** 14531
Region: SS **Location:** Fort Resolution, Fort Smith, Łútsęlk'é

Dezé Energy Corporation Ltd. Taltson expansion project
No research was conducted under this licence.

Blaschuk, Katherine
Imperial Oil Limited
Fifth Avenue Place, 237 - 4th Ave. S.W.
P.O. Box 2480, Station 'M'
Calgary, AB T2P 3M9
katherine.a.blaschuk@esso.ca

File No: 12 402 842 **Licence No:** 14622
Region: SA **Location:** Norman Wells

Bosworth Creek aquatics and fisheries monitoring program
No research was conducted under this licence.

Budziak, Jerry
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jerry.budziak@seaway98.com

File No: 12 402 799 **Licence No:** 14486
Region: SA **Location:** Norman Wells, Tulit'a

Phytoremediation study on the CDN forest et al Nota Creek C-17 wellsite
Phytoremediation is a remediation strategy involving the use of plants to remove contaminants. In theory, plants uptake the contaminant from the soil. The plants are then harvested and removed from the site. This process is repeated until the impacted soil is remediated to applicable guidelines. Laboratory and greenhouse test results using soil samples collected from the salt-impacted Nota Creek C-17 well site supported proceeding with the planting of on-site test plots in 2008 and full site planting in 2009.

Equipment was mobilized to the site in late March 2009 under frozen ground conditions. Soil amendments, which had been brought to the site in the late 1990s and were no longer required, were removed. Personnel were helicoptered to the wellsite in mid to late June 2009. The site was prepared and planted with a treated three-seed mix of annual ryegrass, slender wheatgrass and creeping red fescue. One 10m x 30m test plot was planted with alternating treated and untreated annual ryegrass seed. Plant health and vigor was assessed in mid-August during a monitoring trip. In late September personnel were mobilized to the site to collect plant and soil samples, to harvest the growth from the impacted areas and to remove the growth from the site. Initial results for the 2009 planting are positive and support continuing with a full phytoremediation planting in 2010.

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File No: 12 402 827 **Licence No:** 14532
Region: DC, NS, SS **Location:** Yellowknife

Greening of the boreal forest

Across much of the arctic, climate change is affecting not only permafrost melt, insect outbreaks and forest fires, but also the location of the tree line and plant growth in general. During July of 2009, tree core samples were taken from 11 pine and spruce strands near Great Slave Lake as part of a project that examined recent tree growth and satellite vegetation measurements in arctic and sub-arctic regions. Between 1982 and 2008, the period during which satellite measurements are available and also a period of record air temperatures, negative trends in annual tree growth were observed at six sites (55%), while five sites (45%) showed no annual trend. Of the six sites at which negative trends in growth were observed, five (86%) also exhibited negative trends in satellite-based measurements of vegetation photosynthesis. In all, negative trends in photosynthesis were observed at seven sites (64%), while three sites (27%) showed no trend and one site (9%) a positive trend. A positive, though highly variable, relationship was found between annual growth rates as measured using tree cores and satellite observations. This work suggests that (1) during recent decades rates of tree growth have declined at many sites in the Northwest Territories, and that (2) satellites can be used to monitor forest growth in some regions.

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jcote@cambriagordon.com

File No: 12 402 820 **Licence No:** 14594
Region: SS **Location:** Łútsęlk'é

Lutsel K'e mini hydro project

The main objective of the Lutsel K'e Mini Hydro Project was to identify key fish habitat at the Second Rapids, and to identify the fish species present at the rapids.

During the assessment, angling, netting, snorkeling and electroshocking were used to identify fish. A total of 163 fish were captured including white sucker (n=66), slimy sculpin (n=58), Arctic grayling (n=30), burbot (n=1), northern pike (n=1) and lake chub (n=1). Two distinct habitat types were identified; a riffle and a cascade-pool.

At the Second Rapids site it was determined that rearing and spawning habitat for arctic grayling, white sucker and slimy sculpin was potentially present both above and below the rapids, but not within the rapids. It was also recommended that a winter habitat assessment be completed to document key potential overwintering habitat sites.

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VA, 24141 USA
ddarnell@blacksburg.gov

File No: 12 402 828 **Licence No:** 14533
Region: IN, GW **Location:** Inuvik, Tuktoyaktuk, Fort McPherson, Tsiigehtchic

Botanical collecting - Dempster Highway and Mackenzie Delta

Two amateur botanists explored a variety of arctic habitats in the northwestern NWT from July 22-27, 2009. These included alpine tundra in the Richardson Mountains, boreal forest and muskeg in the Mackenzie Delta, and coastal tundra and saltmarsh on the arctic coast near Tuktoyaktuk. After verfying their location using topographic maps and a hand-held GPS unit, they photographed and/or collected and pressed representative common plants and lichens in each habitat type. Along the Dempster Highway, the researchers took care to stop only on Crown land, having noted all areas of Gwich'in private land on their maps. For collections near Tuktoyaktuk, they obtained an access permit from the Inuvialuit Land Administration and also hired a local guide.

Using botanical reference books and online resources, the researchers have identified nearly all of the 63 specimens collected and most of the photographs taken in the NWT, and are preparing a comprehensive list, with precise location and habitat data, for submission to the Aurora Research Institute. Specimens are being mounted and labeled and some will be deposited in the Massey Herbarium at Virginia Polytechnic Institute and State University in Blacksburg, Virginia, USA to enhance their collection of arctic plants.

Evans, Marlene
Environment Canada
11 Innovation Blvd.
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marlene.evans@ec.gc.ca

File No: 12 402 503 **Licence No:** 14468
Region: GW **Location:** Inuvik, Aklavik, Fort McPherson, Tsiigehtchic

Biological studies of waters along the proposed Mackenzie Gas Project pipeline route - Gwich'in Settlement Area

In March 2009, a limnological survey of lakes was conducted in the Gwich'in Settlement Area as part of a baseline study focusing on lakes along the proposed Mackenzie Gas Pipeline route. These lakes were Deep, Sandy, Hill, and Travaillant. Sampling sites were near the center of each lake. Snow depth averaged 28 cm and lake ice thickness averaged 1.07 m. Temperature, conductivity, and pH were measured at 2 or 3 depths in shallow lakes (<5 m), and at more depths in deeper lakes. Lakes were well oxygenated with the exception of Hill, where oxygen concentrations were very low in this shallow lake (1.8 m deep). Oxygen concentrations were also low just above the bottom (6.2 m) of Travaillant Lake. Dissolved phosphorus, ammonia, and nitrate concentrations were low and only slightly higher in March than in summer; this, along with low temperatures and ice cover, would have limited algal growth. Chlorophyll concentrations were low (<1.4 µg/L) except at Hill Lake where concentrations were 7.3 µg/L. Phytoplankton were dominated by small green and blue-green algae. These data, and data collected in March 2007, can be used to assess whether global warming, if it continues, or the pipeline, if it is constructed, will affect the winter conditions of the four study lakes.

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File No: 12 402 503 **Licence No:** 14467
Region: IN **Location:** Inuvik, Aklavik, Tuktoyaktuk

Biological studies of waters along the proposed Mackenzie Gas Project pipeline route - Inuvialuit Settlement Region

In March 2009, a limnological survey of lakes was conducted in the Inuvialuit Settlement Region as part of a baseline study focusing on lakes along the proposed Mackenzie Gas Pipeline route. These lakes were Big, Old Trout, Parsons, Yaya, Pullen, Wolf, Jimmy, Noell, Mid, Denis Lagoon and 2 unnamed lakes (Lake 1 and 10) northwest of Old Trout Lake. Sampling sites were near the center of each lake. Snow depth averaged 21 cm and lake ice thickness averaged 1.57 m. Temperature, pH and conductivity were measured at 2 or 3 depths in shallow lakes (<5 m), and at more depths in deeper lakes. Lakes were well oxygenated with the exception of Jimmy Lake, where oxygen concentrations were low at 7 m depth, and Mid Lake, which was shallow (3 m). Dissolved phosphorus, ammonia, and nitrate concentrations were generally low and only slightly higher in March than in summer; this, along with low temperatures and ice cover, would have limited algal growth. Chlorophyll concentrations were low (<1.6 µg/L) except at Parsons Lake (2.4 µg/L) and Mid Lake (5.1 µg/L). Phytoplankton were dominated by small green and blue-green algae. These data, and data collected in March 2007, can be used to assess whether global warming, if it continues, or the pipeline, if it is constructed, will affect the winter conditions of the study lakes.

Gillespie, Lynn
Canadian Museum of Nature
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Ottawa, ON K1P 6P4
lgillespie@mus-nature.ca

File No: 12 402 572 **Licence No:** 14524
Region: IN, SA **Location:** Paulatuk, Délı̨nę

Flora of the Canadian Arctic – diversity and change

In 2009 we studied the flora east of Paulatuk along the lower Brock River and coast, in the vicinity of Paulatuk, and in Tuktut Nogait National Park. We made 540 vascular plant collections outside the park, including many first records of species for this region. Many of our new collections represent significant range extensions. We identified our new collections using the latest information on taxonomy and systematics of arctic plant species, and also critically re-examined nearly all known existing plant collections that have been made in the region, to make a complete baseline plant list of the area. Our moss biologist did not make the trip; nevertheless we made 50 moss collections, currently being identified. The known vascular plant flora for the entire region now comprises 268 species (228 outside the park). This flora includes 14 vascular plant species of potential conservation concern, including three species assessed as "May be at risk". We have begun DNA barcoding studies on the plants we collected and will be giving a poster and an oral presentation on the field work at the Canadian Botanical Association Conference in Ottawa, June 2010.

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University of Northern British Columbia
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greens@unbc.ca

File No: 12 402 807 **Licence No:** 14520
Region: GW **Location:** Fort McPherson, Tsiigehtchic

Treeline dynamics in western Canadian Arctic

Field measurements (tree cores taken to examine growth rings) were taken during the summer of 2009 along the northern Dempster Highway. Early summer activities focused on Yukon sites and late summer activities focused on sites in the NWT. Sample processing has been completed, and results are currently being reviewed. Early findings suggest that warming temperatures in the western Canadian Arctic will impact tree growth and likely influence tree health. Sensitivity to warming conditions seems to be very place specific, so some areas in northern Yukon and NWT may see significant changes in tree growth and health (either positive or negative responses) while other areas may show only small responses. We are currently trying to identify "high sensitivity" environments, which should be useful in putting communities into a sensitivity ranking that would identify those communities that are most likely to see significant changes in tree/forest ecosystems. Data analyses should be completed by September 2010, followed by publication of papers and reports describing the project findings and implications.

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Department of Geography, Planning and Environment
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File No: 12 402 677 **Licence No:** 14519
Region: GW **Location:** Inuvik

Black spruce fertility at the arctic treeline

While an inadequate supply of pollen is known to limit the reproductive success of animal-pollinated plants, few studies have examined the effects of pollen limitation in wind-pollinated plants. This is surprising considering the prevalence of wind-pollination at mid-to-high latitudes. Therefore, an experiment which limited pollen receipt by the seed producing cones of a common boreal tree species, black spruce, was conducted.

Pollen was excluded during the pollen release period by placing cotton muslin bags around seed cones, with the time bagged varying from one to six days. Pollen grains per cone scale were found to be independent of exposure period, and were found to be randomly distributed for cones, averaging 4 grains per scale.

Ambient pollen concentrations were measured at 2 hour intervals (over 12 hours) using two devices – a rotorod (motorized) and a passive collecting device – and compared to meteorological conditions. Concentration was found to be directly related to temperature and inversely related to relative humidity. The pollen concentration measured by the passive collector device was on average four times greater than that measured by rotorods. The two measuring devices were significantly correlated with one another.

Although some of these results create more questions than they resolve, two things are clear. The first is that, at low concentration, pollen is randomly distributed. The second is that passive collectors, which are far cheaper than rotorods, appear to be a reliable method for measuring pollen concentration.

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File No: 12 402 780 **Licence No:** 14546
Region: SA **Location:** Norman Wells

Bosworth Creek monitoring project
The Bosworth Creek Monitoring Project (BCMP) is a high resolution, long-term study of a 125 square kilometre watershed in Norman Wells, NWT. The project was initiated after the Sahtu Renewable Resources Board received a request from local residents for information on fish stocks in Bosworth Creek after the removal of a weir in 2005 by Imperil Oil Resources. This project has focused on creating baseline biological and chemical inventories for the past two years, which are nearly complete. These permit the focus of the investigation to broaden to include: microhabitat studies; monitoring the timing, distribution and relative abundance of biotic communities; and investigation of issues related to climate change that appear to be affecting groundwater distribution. The project will continue to monitor potential or existing impacts by climate change and industry.

The BCMP has become a permanent component of Mackenzie Mountain School's high school curriculum through the NWT Experiential Science Program. The BCMP will continue to provide professional development for local youth through associations with academic and industrial institutions. This project is creating baseline biological and chemical data collections that will result in useable resources for local stewardship by the Renewable Resource Council.

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Golder Associates Ltd.
1721 - 8th Street East

Saskatoon, SK S7H 0T4
dhamilton@golder.com

File No: 12 402 834 **Licence No:** 14572
Region: DC **Location:** Nahanni Butte

Canadian Zinc Corporation – habitat compensation investigation

Under the licence, Golder Associates Ltd. (Golder) collected aquatic baseline information to assist in the design of the project. Objectives of the baseline program (year 2) were to collect additional fish habitat data for use in the development of a fish habitat compensation plan. Fieldwork was completed between July 28 and July 31, 2009. Fieldwork was limited to habitat assessments in Prairie Creek and Funeral Creek. Following a preliminary examination of several of the stream crossings, and further community consultation regarding the options being considered for the fish habitat compensation plan, the option to include stream crossing upgrades in the habitat compensation plan was removed from further investigation. Therefore, no sampling was done on the Liard River tributaries crossed by the Liard Highway. No fish sampling was conducted in Prairie Creek or Funeral Creek, due to a malfunction of the anode pole of the backpack electrofisher. Additional habitat surveys were completed in Prairie Creek and Funeral Creek. The results of the 2009 field program will be incorporated into the revised draft fish habitat compensation plan, which will be submitted to Fisheries and Oceans Canada in late January 2010.

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bmhoar@ucalgary.ca

File No: 12 402 789 **Licence No:** 14503
Region: NS **Location:** Yellowknife

Conceptual and mechanistic models for the development and survival of the trichostrongylid, Ostertagia gruehneri, in barrenground caribou, with respect to northern climate change

This project investigates the impact of climate change on the development and survival of the most common stomach parasite of barrenground caribou, Ostertagia gruehneri. The first objective of this project was to determine the development and survival rates of O. gruehneri on the tundra under natural and artificially warmed conditions. This part of the project was completed from May to September of 2008 at the Tundra Ecosystem Research Station (TERS) in Daring Lake, NT. The second objective of this project was to determine the ability of O. gruehneri to survive the winter on the tundra. Samples from the 2008 field season were left on the tundra over the winter and then sampled throughout the spring of 2009. Overwinter survival of O. gruehneri was near 100%. Under natural conditions, the number of larvae recovered from plots decreased throughout June 2009, but under warmed conditions, the number of larvae remained constant throughout June.

Results from this project were presented at the International Workshop for Arctic Parasitology (1-4 June, Longyearbyen, Norway) and the IPY Oslo Science Conference (8-12 June, Oslo, Norway) in 2010. A manuscript based on this field work is currently being prepared for publication.

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File No: 12 402 585
Licence No: 14504
Region: DC
Location: Fort Liard, Fort Simpson, Nahanni Butte

Aquatic environmental effects monitoring - Flat River at Cantung Mine
No research was conducted under this licence.

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File No: 12 402 829
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Region: IN
Location: Tuktoyaktuk

Assessment of fisheries potential of the Tuktoyaktuk to Source 177 all-weather road impact area
The Hamlet of Tuktoyaktuk and its partners have undertaken the construction of a 19 km access road to a gravel pit known as Source 177. The road runs south of the Hamlet, and is located on Inuvialuit-owned lands. A fisheries potential assessment was undertaken along the access road on June 30 and July 1, 2009.

Eight potential watercourse crossings along the road were assessed to identify potential fish habitat, and water quality, physical measurements, and habitat assessments were completed. Four watercourses had the potential to bear fish, and fish habitat surveys were conducted at each. Electrofishing was used to collect fish at three of the watercourse crossings. Four fish species were observed or captured: ninespine stickleback, Northern pike, broad whitefish, and cisco. None of the fish species observed in the area are rare. The habitat at the watercourse crossings is neither unique nor in short supply.

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Region: NS, SS
Location: Yellowknife, Fort Resolution, Łútsęlk'é

2008-2010 baseline studies for Avalon Ventures Ltd. proposed Thor Lake rare earth metals project - vegetation component

A vegetation field survey was undertaken from June 22 – 29, 2009, by a senior vegetation specialist and a rare plant specialist/vegetation ecologist to gather data in support of terrestrial ecosystem mapping (TEM) and a rare plant survey in the Thor Lake area.

Two separate study areas were defined; the local study area (LSA) and a regional study area (RSA). The vegetation field work and detailed ecosystem mapping were focused in the LSA in order to support a pre-feasibility assessment. The mapping for the LSA was done at a scale of 1:20,000. The RSA mapping was completed in support of vegetation and wildlife habitat assessments and analysis, and was done at a scale of 1:50,000.

A modified ecosystem sampling plan was developed following the methods outlined in the Standard for Terrestrial Ecosystem Mapping in British Columbia. Twenty ground inspections and 59 visual inspections were completed in the LSA. A reconnaissance-level survey of the RSA was completed by performing 85 aerial inspections from a helicopter. Twenty different ecosystem units were mapped in the LSA and 11 broad ecosystem types were mapped in the RSA.

In addition, an early summer rare plant field survey was conducted along with the TEM vegetation field surveys. The rare plant study was carried out only in the LSA and followed the methodology set out by the Alberta Native Plant Council. In total, 56 plots were assessed for rare plants. A general survey of invasive plant species presence was performed at the same time as the rare plant field work.

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Region: NS, SS
Location: Yellowknife, Fort Resolution, Łútsęlk'é

2009-2010 baseline studies for Avalon Ventures Ltd. proposed Thor Lake rare earth metals project - aquatics component

Three field programs for the Thor Lake baseline aquatics program were conducted in 2009. This included late March water sampling, mid-June water and biota (phytoplankton, zooplankton) sampling, and September water, sediment, plankton and benthic invertebrate sampling at 23 lake stations. A 24th station (a far-field reference) was added in September.

Results from the 2009 program indicate neutral to basic water and very low nutrient levels at all stations. There were large fluctuations in some parameters, primarily during winter in small, shallow lakes that developed highly reducing, anoxic conditions under ice. Sediment characteristics varied, though generally lake sediment had high phosphorus, nitrogen and organic carbon content; metal levels ranged from less than detection to higher than the guidelines set by the Canadian Council of Ministers of the Environment.

Chlorophyll levels varied among lakes and seasons, but most of the lakes can be considered oligotrophic. A total of 171 phytoplankton taxa were identified, 7 of which were common to all lakes. A total of 43 zooplankton taxa were identified, 5 of which were common to all lakes. Benthic invertebrate data was not available at the time of this summary report.

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Region: NS, SS **Location:** Yellowknife, Fort Resolution, Łútsę̨lk'é

2009-2010 baseline studies for Avalon Ventures Ltd. proposed Thor Lake rare earth metals project - fisheries component

The 2009 Fisheries study at Thor Lake included three field programs: winter fishing and water quality measurements in one lake in March; spring stream surveys at nine sites in May, and fall lake surveys at 18 lakes in September.

The March work investigated the presence of fish during the winter in Fred Lake, a suspected habitat sink downstream of Thor Lake. Minnow traps and gill nets were set under the ice, and dissolved oxygen was measured throughout the water column at twelve stations. No fish were captured, and dissolved oxygen levels were low (4 mg/L or less) at all depths except immediately below the ice.

The May work investigated the habitat quality, presence of fish and potential for fish passage at nine stream sites. The field investigation revealed that fish passage is possible between Thor Lake and Murky, Long and Fred Lakes, but not between any other lakes. Fish were captured in Murky Out and Long Out.

The September work included physical habitat measurements (bathymetric and shoreline surveys), fishing effort (gill netting, beach seining, dip netting, and minnow trapping), and fish tissue collection for metals analysis. Eighteen lakes were fished in September 2009, including a far field reference lake (Redemption Lake), which is 17 km northeast of Thor Lake. Fish were captured in ten of the lakes. Lake whitefish, northern pike, lake cisco, slimy sculpin, and ninespine stickleback were the most common species captured.

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Region: NS **Location:** Yellowknife

Miramar Con Mine environmental effects monitoring Phase 3 study – investigation of cause

Golder Associates Ltd. was contracted by Miramar Con Mine Ltd. to collect environmental, fish, and invertebrate data in 2009 for the Phase 3 Environmental Effects Monitoring (EEM) program for Con Mine, as required under recently developed federal Metal Mining Effluent Regulations (MMER).

Sampling was conducted by Golder in and around the Yellowknife Bay of Great Slave Lake in August and September 2009. Jackfish Bay (downstream from the outflow of Con Mine) was sampled for fish and invertebrates because it is an area exposed to mine effluent. A bay at Horseshoe Island was sampled for fish as a reference area that is not exposed to mine effluent. These sites were chosen because they had similar fish habitats and species richness.

The field survey consisted of sampling fish from the exposure and reference areas. The fish studies consisted of a population survey of small bodied fish at both sites. The target species was ninespine stickleback. Small bodied fish were sampled using a variety of gear (minnow traps and seine nets), and were processed for length, weight, age, liver weight and pathology, gonad weight and pathology, liver arsenic concentration, and liver lipid/glycogen concentration.

Data collected during the field survey will be reported in the Phase 3 EEM final interpretative report and submitted to Miramar Con Mine Ltd. and Environment Canada in June 2010, as required under the MMER.

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Region: NS **Location:** Wekweètì,

Diamond mine reclamation in the NWT: substrates, soil amendments and native plant community development
No research was conducted under this licence.

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Region: SS **Location:** Fort Smith

Structure, carbon dynamics, and silvichronology of boreal forests
Forests absorb carbon dioxide from the air and fix it as organic matter. Forests therefore have a potential role in reducing the carbon dioxide concentration in the atmosphere. This is related to the problem of global warming, which is caused by increasing concentrations of carbon dioxide in the atmosphere.

The amount of carbon fixed in trees, and moving through forests of jack pine and black spruce in Wood Buffalo National Park and adjacent areas, were measured. This involved three things: 1) estimating how much trees grow; 2) measuring the amount of leaves and branches that fall from the trees to the ground; and 3) estimating how much thin roots grow and die in a year. Fallen leaves and branches, and thin roots that accumulated in "traps", were collected and brought back to the laboratory for analysis.

The history of organic matter accumulation in the forests, called "silvichronology", was estimated by close examination of tree rings and tree sizes. This was a new area of study that was tested during this project. This method will also be applied to a forested region of about 10 km^2 to demonstrate that this method can be applied in larger areas.

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Region: DC **Location:** Fort Liard, Fort Simpson, Nahanni Butte, Wrigley

Quantifying the effects of mining activities on the health of streams in the South Nahanni watershed
The objective of this study was to complete the final collections of water, benthic invertebrates and benthic algae that, following analysis, would be used to assess the effects of mining activities on the health of streams in the South Nahanni watershed.

In August 2009, our three-member field crew collected samples of water, benthic invertebrates and algae from 43 stream sites located throughout the South Nahanni watershed. These sites included those located immediately upstream and downstream of mining sites on the Flat River (the Canadian Tungsten's Cantung mine) and in Prairie Creek (the Canadian Zinc exploration mine). Environment Canada, the University of Waterloo and environmental consultants will process samples and the resulting data should be available for analysis and interpretation in spring 2010.

Given the 4-6 month period of time required to process water, benthic macroinvertebrate and algal samples, the final report is scheduled for completion by October 2010. This time frame is required because data collected in fall 2008 (from 73 sites) needs to be combined with data collected in fall 2009 (from 43 sites). This final integrated report will provide resource and land managers with a baseline description of current conditions in the South Nahanni watershed, allow them to assess the effects of mining activities on stream health, and develop a long-term program to monitor the ecological health of streams in the South Nahanni watershed following continued mining or the establishment of new mines.

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Region: NS **Location:** Behchokò, Wekweètì, Yellowknife

Improving habitat connectivity to enhance productive capacity of arctic freshwater ecosystems

To make up for lake and stream habitat lost during mine construction, Diavik Diamond Mines, Inc. has proposed two compensation projects having the goals of (a) improving in-stream habitat for fish and (b) increasing the likelihood that fish can swim through small streams and colonize lakes located upstream. Our University of Alberta research team began a 4-year field research program in 2009 that will evaluate the success of the compensation projects at increasing the productivity of the modified streams and their upstream lakes. We will sample these "impact" lakes and streams for 2 years before and 2 years after the modifications, and also sample "control" lakes and streams that will not be modified over the same period. Our goals in 2009 were to choose appropriate "controls" and begin sampling the fish, invertebrates, habitat characteristics, and water conditions of the "control" and "impact" lakes and streams. Seven lakes and six streams were sampled between June 30 and August 18. Eight fish species were gill-netted from the lakes (lake trout, round whitefish, arctic grayling, and slimy sculpin were the most common). Only 4 fish species were observed in the streams, mostly near to where the streams flowed out of, or into, a lake.

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File No: 12 402 842 **Licence No:** 14603
Region: IN, GW **Location:** Inuvik

Northern native seed development field trials

In 2009, three native seed field plots in the Inuvik area were visually assessed for seedling survival, reproduction efforts (ie. evidence of flowers or seed production), and the general health of the plants. There were no disturbances made to the plots or the surrounding terrain. Data is still being reviewed.

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File No: 12 402 839 **Licence No:** 14590
Region: DC **Location:** Wildfire near Sandy Lake, that occurred in July 2008 (60 deg 34' 12.6" N, 114 deg 26' 25.5" W, 100m west of territorial highway 5, just north of Wood Buffalo National Park)

Ecohydrologic impacts of wildfire on peatlands

Our 2009 fieldwork focused on examining the Sandy Lake fire of 2008, which occurred just north of Wood Buffalo National Park. The depth of burn in the burned forest peatland (muskeg) was examined using a tree-root analysis. The fuel available for a fire was evaluated by measuring the density and height of trees, as well as the amount of live spruce needles and tree lichens (commonly called old man's beard). Surveys of ground moss, lichen, and shrub vegetation were also made. The fuel surveys and depth of burn data were used in models of the intensity of fire through the peatland, and the potential depth of burn. This data is very important, as it can be used to make predictive models of peatland fire behaviour (flame height and rate of spread) and the extent of smouldering. This has implications for the safety of firefighters battling the wildfires, as well as the resources required to extinguish the smouldering combustion. The amount of time before the peatland recovers to its pre-fire state and is suitable for use as wildlife habitat will also be affected by the intensity of the fire.

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File No: 12 402 833	**Licence No:** 14571
Region: IN	**Location:** Inuvik, Tuktoyaktuk

Ecology of white spruce at the species limit in NWT, Canada
The northern treeline is one of the most prominent biogeographical boundaries in the world, yet a comprehensive understanding of the mechanisms controlling tree reproduction, establishment, and growth at the treeline has yet to be established. Climate is considered one of the most important factors controlling treeline dynamics, and as temperatures increase, the treeline is expected to shift northwards. Implications of an advancing treeline include an increase in terrestrial carbon sequestration, a major change in the regional energy balance, and an alteration of biodiversity in the forest-tundra ecotone.

The main objective of this research was to characterize the ecological patterns and processes of white spruce in the Tuktoyaktuk region, NT. In particular, this study aimed to determine how climate influences white spruce reproduction, establishment, and growth throughout the forest-tundra transition zone. A total of four forest stand sites and eight tree island sites were examined in the summer of 2009. Cones were produced at all but one of the sites, and female cones were collected from every site that produced them. Germination trials will be completed on seeds collected from these sites. Seed viability can then be regressed against distance from treeline and compared over time. In addition to evaluating the trees at each site, soil samples were collected and will be analyzed for nitrogen (N), carbon (C), and pH, and the vegetation composition near all trees was determined. Assessing reproduction, establishment, and growth of white spruce at all of these sites will help determine where and how these parameters respond to climatic variation from south to north along the forest-tundra gradient, and over time.

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File No: 12 402 826	**Licence No:** 14527
Region: DC, NS, SS	**Location:** Fort Liard, Fort Providence, Fort Simpson, Jean Marie River, Nahanni Butte, Wrigley, Gamètì, Behchokò, Yellowknife, Enterprise, Fort Resolution, Fort Smith, Hay River, Hay River Reserve, Kakisa

Changing fire regimes in northern coniferous forests

Study areas were located in northeast British Columbia, northwest Alberta, the Yukon and the Northwest Territories between 57°N and 63.5°N latitude, and 111°W and 125°W longitude. Sampling was restricted to forests no more than 1.1 km from a road. Altogether 85 plots were studied, of which 36 were located in the Northwest Territories. The radius of the circular study plots was 100 meters, giving an area of 3.1 ha per plot.

Fire scars on trees were used as a primary source for fire dates. In addition to fire scarred trees, 3-6 dominant trees in every plot were sampled for their age. Sampling was performed with a chainsaw and increment corer. Samples from 509 trees (232 from the NWT) were brought to a laboratory for analysis under a microscope.

Signs of fire were present throughout the studied landscape. Fire scars were only found in about half of the study plots, but charred wood and regenerated cohorts of trees provided evidence for stand-replacing fires in the rest of the plots. All study plots had burned at least once during the previous 220 years. During the last two centuries, the average proportion of the study area that burned annually was 1.3%, corresponding to a fire interval of 77 years.

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Region: NS
Location: numerous lakes, streams and locations within the EKATI mineral land claim boundary.

EKATI aquatic monitoring program, 2009-2013

In 2009, five monitoring projects were ongoing in the lakes and streams of the Koala, King-Cujo, and Pigeon watersheds, where EKATI mine infrastructure are located. These were the Aquatic Effects Monitoring Program (AEMP), the Panda Diversion Monitoring (PDC) Program, the Nero-Nema Stream Monitoring Program, the Long Lake Containment Facility (LLCF) Nitrate in situ Treatment Test, and the Fay Lake Monitoring Program.

AEMP and the Fay Lake Monitoring Program assessed the current conditions in the lakes and streams of the Koala, King-Cujo and Pigeon watersheds to determine whether there have been any mine effects. The assessments incorporated some or all of the following: meteorology, hydrology, water quality and physical limnology, phytoplankton, zooplankton, benthos and fish data. Data analyses for the 2009 year, as well as a detailed review of the AEMP plan for 2010-2012, are currently being completed.

Fish populations in the PDC were monitored for the 11th consecutive year. A compilation and analysis of this work is also in progress. Assessment of fish habitat created in Nero-Nema Stream was also ongoing in 2009.

The Nitrate in situ Treatment Test is a mitigation strategy developed and implemented on a trial basis in 2009 to reduce nitrate concentrations in the LLCF. The test involved nutrient manipulation in Cell D of the LLCF during the open water season. Water quality and physical limnology, phytoplankton, and zooplankton were monitored during the study. This monitoring is ongoing.

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Region: IN **Location:** Inuvik, Tuktoyaktuk

Hydro-ecological responses of arctic tundra lakes to climate change and landscape perturbation

Through on-going investigations in small arctic ponds/lakes, it has become evident that some of the small pond/lake food webs may include very small fish (such as stickleback) that act as top-down controls on food web structure and productivity.

In 2009, the small ponds/lakes in this study were examined to see if they contain fish. Also, the food-web in Noell Lake was a focus of this study as two other lakes in this study drain into Noell. Food-web surveys were conducted in Noell Lake and the 2 small lakes that drain into Noell in July, and on 9 small ponds/lakes north-east of Inuvik in August. Of the 11 small lakes originally thought to be fishless, four lakes do not host fish populations. The other seven lakes hosted ninespine stickleback, pond smelt, or northern pike. In one case, both stickleback and pond smelt were present. In one small lake, we also collected a burbot minnow. At Noell Lake, the expected suite of species was collected. Samples of the fish and other food-web members are currently under laboratory analysis to determine the structure and function of the food webs in these lakes (i.e. what the fish and other members of the food-web eat).

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Region: IN, SA, DC, NS **Location:** Paulatuk, Délı̨nę, Fort Providence, Behchokò

Arctic wastewater research

The Canadian Council of Ministers of the Environment (CCME) approved the Canada-wide Strategy for the Management of Municipal Wastewater Effluent in 2009. The CCME Strategy recognized that Canada's north faces unique challenges due to extreme climate conditions and remoteness and provides a five year window to research factors that affect performance of wastewater systems in northern conditions. Environment Canada has started research to investigate the performance of wastewater treatment under arctic conditions.

In 2009, research was conducted in Paulatuk and Behchokò (Rae), Northwest Territories. Both use sewage lagoons followed by wetlands for wastewater treatment.

In Paulatuk, samples of raw wastewater, lagoon effluent , and final effluent were collected in July and in September. Raw wastewater concentrations ranged between 170-333 mg/L for Total Suspended Solids (TSS) and 315-470 mg/L for Carbonaceous Biochemical Oxygen Demand (cBOD). The lagoon effluent showed TSS concentrations ranging from 46-144 mg/L in July and 20-34 mg/L in September and cBOD concentrations ranging from 39-75 mg/L in July and 26-30 mg/L in September. The final efflued showed TSS concentrations ranging from 8-14 mg/L in July and down to 6 mg/L in September and cBOD concentrations less than 1 mg/L in July and less than 5 mg/L in September. In Behchokò, only the lagoon effluent was analyzed. TSS concentrations were 34 mg/L and cBOD concentrations ranged from 12-14 mg/L.

Results from Paulatuk indicate that the sewage lagoon at this location led to great reductions in TSS and cBOD. The quality of the effluent was better in September than in July, showing improved treatment through the summer. The wetland also contributed significantly to the treatment of the wastewater. Additional samples are required to verify the performance of the Behchokò wastewater treatment.

Environment Canada is hoping to conduct additional sampling at these locations to increase knowledge about wastewater treatment in the arctic.

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Phase I environmental site assessments at nine abandoned mines, Northwest Territories

EBA Engineering Consultants Ltd. (EBA) was retained by Public Works and Government Services Canada (PWGSC) to conduct Phase I Environmental Site Assessments (ESA) at nine abandoned mine sites in the Northwest Territories. The nine sites ranged in past activity from advanced exploration sites with trenching and minor underground workings, to sites where mining and milling were conducted. A thorough review of all available site information was conducted in order to plan the field work component. The field work for the Phase 1 ESA was conducted during August and September of 2009. Personnel from EBA along with a wildlife monitor examined each of the nine sites to document potential environmental impacts relating to historical mining activities at each site. The results of the historical information review and the field work were used to develop recommendations and budgets for additional Phase II ESA work where it was deemed necessary. A total of nine Phase I ESA reports were prepared and submitted to PWGSC as the final deliverable of the project.

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Phase I environmental site assessments of Rocher River(SM169), Little Dal/ Coates Island(SM053), Tennoco Root River

A Supplemental Site Investigation (SSI) in support of a Detailed Quantitative Human Health and Ecological Risk Assessment (DQHHERA), Remedial Action Plan (RAP) update, and risk based remediation was recommended with a preliminary scope and substantive cost estimate provided.

Feasible remedial options explored included excavation and off-site disposal of high risk media, and on-site containment of high risk media in an engineered landfill. Estimated Class D (+/- 50%) remedial costs ranged from $8.4M to $5.0M for off-site disposal and on-site engineered containment, respectively. Both options are challenged by mobilization to the remote site, which accounts for 30% to 50% of the total remedial costs, respectively.

Both remedial options scored similarly when evaluating all criteria. The scoring was reduced in areas primarily due to data gaps and uncertainty including: viability of Giant Mine disposal option; refined tonnage of impacted soil posing unacceptable risk; refined ice road costs and synergies with other projects requiring an ice road in vicinity of the site; requirement for hazardous waste stabilization, methodology and costs; treatability of leachate; capacity for natural attenuation of arsenic in wetland down-stream of Mine Area; and public consultation. It is recommended that both remedial options be retained and reconsidered upon completion of the SSI and DQHHERA. It is also recommended that the SSI target data gaps specific to refining the remedial action plan for Option 2 (on-site engineered containment), as well as mobilization costs to the site.

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Location: Yellowknife

Blanchet Mine/ O'Connor Island Phase III environmental site assessments

No research was conducted under this licence.

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Region: SA

Licence No: 14554
Location: Between the north shore of Ho-Hum Lake and the south shore of Rainy Lake (Camsell River), around the Terra Mine Site

Arsenic sequestering by microbial activity in wetlands adjacent to the Terra Mine tailings lake, Northwest Territories

Terra Mine is located on the Camsell River to the southeast of Great Bear Lake, NWT. Investigations of the Terra Mine wetland have shown that there is some arsenic in the water and sediments in the wetland, which may be linked to mining activities at Terra Mine. If there is too much arsenic in one location it can sometimes be harmful to plants and animals. The goal of this project is to understand how the arsenic is attached to small grains in the sediment, and to determine whether arsenic will come off the sediment and move into the water. This is important because arsenic is able to spread more when it is in water than when it is attached to sediment.

Water and sediment samples were collected at three places in the wetland in both June and August of 2009. The sediment was then put into bottles with some of the water. These bottles, referred to as "microcosms", are mini versions of the wetland which allow us see how much arsenic will come off the sediment and into the water without having to measure all the water in the wetland.

Tiny organisms living in the sediment can speed up the movement of arsenic on or off the sediment grains. They are too small to see without a microscope, but are very important in the wetland. Part of this project was to investigate these organisms and their effect on arsenic. This project found that there are some organisms in the Terra Mine wetland that use arsenic to make energy, much like humans use food.

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Licence No: 14593
Location: Gamètì,Behchokò, Wekweètì, Whatì, Yellowknife, Łútsę̀lk'é

Diavik fish palatability & metals program

The objectives of the 2009 program were to obtain feedback from community members that related to Lac de Gras lake trout taste, texture and general condition/health, and to meet the requirements set out in the Diavik Diamond Mines Inc. (DDMI) Fisheries Authorization.

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Region: SA, DC, SS
Location: Colville Lake, Délı̨nę, Fort Simpson, Fort Resolution, Łútsę̀lk'é

Spatial and long-term trends in persistent organic contaminants and metals in fish from the Northwest Territories

This study determined contaminant level trends in lake trout harvested from Great Slave Lake near Lutsel K'e (East Arm) and Hay River (commercial fishery; West Basin). Contaminant levels in burbot collected from the Fort Resolution area (Slave River outflow, West Basin) and Lutsel K'e were also investigated. This study began in 1993, and has continued up to and including 2009.

Some persistent organic pollutants (POPs), such as HCH, are declining in concentration, while others, such as PCBs, are showing little change. Mercury levels are increasing in burbot in both regions of the lake, and in lake trout in the West Basin. Lake trout were also collected from Cli Lake and Colville Lake in 2009 to assess mercury levels; mercury concentrations generally were similar to those observed in previous years. Analyses of data collected during this study show that mercury levels are increasing in lake trout in lakes along the Mackenzie River with the greatest increases occurring in smaller lakes with large watersheds, where fish are most likely to be influenced by processes occurring in shallow, warm, inshore waters. These increases may be due to warming trends and/or increased mercury emissions, and are under further investigation.

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Location: Fort Resolution, Hay River, Łútsę̀lk'é

Enhanced investigations of the factors affecting long-term contaminant trends in predatory fish in Great Slave Lake, Northwest Territories

In March 2009, a winter limnological study was conducted in Great Slave Lake with the primary purpose of collecting sediment cores to investigate trends in mercury, and other contaminants, in lake sediments over time. Sediment cores were collected at two sites in the West Basin and one site near Lutsel K'e in the East Arm; limnological sampling was conducted at a third site in the West Basin. Snow cover averaged 14.6 cm and ice thickness 1.28 m. The water column was well oxygenated and nutrient concentrations were low; chlorophyll concentrations were also low, except just below the ice at two sites.

Limnological features were generally similar to those observed during previous sampling in 1992 and 1994. Mercury concentrations in the sediment cores were higher in the West Basin than in the East Arm, and concentrations in sediments that were deposited between 1990-2008 were similar to concentrations in sediments that were deposited between 1950-1990. The flux of mercury to the sediment varied over 1950-2008, with variations in sedimentation rate the main factor affecting this variation. Sediment core data will be used to further investigate the factors affecting mercury time trends on burbot and lake trout in Great Slave Lake.

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Old Parr and Liten Mine phase II/III ESA
AMEC Earth and Environmental, a division of AMEC Americas Limited, conducted a Phase II/III Environmental Site Assessment for Public Works and Government Services Canada and Indian and Northern Affairs Canada in August of 2009 as part of the Contaminated Sites Program.

The site assessment was carried out at the historic and abandoned Old Parr / Liten Mine 50 km northeast of Yellowknife, NT. This mine site included open pits, waste rock, a tailings pond, numerous mining structures including an ore bin and crushing station, and a cabin originally owned by the late Louis Garskie of Hyth, AB who was also the proprietor of the mine. The assessment included an archaeological impact assessment, soil/water/sediment evaluation, a geochemical assessment, a hazardous materials assessment of mine openings, and assessments of potential borrow areas. Fieldwork at the abandoned mine was conducted from August 17th to 21st 2009 by five field personnel from AMEC Calgary and five wildlife monitors from the Yellowknife area. The fieldwork and lab results from samples collected from the mine were presented in a final report completed in March of 2010. In this report, areas of concern were highlighted and conceptual remediation options for the reclamation of the mine were presented.

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Phase II environmental site assessment of ten (10) sites along the Canol Trail (NM050)

Franz Environmental Inc. undertook a Phase II Environmental Site Assessment (ESA) of nine sites along the Canol Trail. The sites were chosen based on a wide variety of issues and unique site usages. As such, the chosen sites would act as representative conditions at similar sites along the Canol Trail.

A detailed survey of the sites was completed from July 21 to 31, 2009. The survey consisted of an inventory and evaluation of the buildings, waste debris and dump sites at each of the sites, along with an evaluation of site characteristics and potential source areas for contamination.

Petroleum hydrocarbon impacts at a site are typically associated with fuel handling areas or pipeline spills. Metal-impacted soils are typically found in metal debris/dump areas and drum caches. PCBs and pesticides were not detected at significant levels at any of the study sites. Asbestos-containing materials were found in items such as vehicle brake pads and wall board present in furnace/heating rooms. Most of the wooden structures were unpainted; however, painted surfaces typically reported elevated lead concentrations and non-detectable levels of PCBs. Although drum piles were found along the trail, most of the drum caches were less than 50 drums, and it was estimated that only 5-10% of the drums contain a fuel/water mixture.

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Old Canadian National railbed and Highway 5 soil sampling, Hay River area

Lead and zinc concentrate was transported along a rail corridor from the abandoned Pine Point Mine to Pine Junction, near Hay River, for 20 years. The 80 km section of railbed was reclaimed and decommissioned in 1996; however, there is concern that dust from the lead and zinc concentrate may have contaminated soils on or near the railbed.

The objectives of this research were 1) to perform an initial assessment of lead, zinc, and hydrocarbon levels in soils on and near the railbed, and 2) to determine natural background levels of lead and zinc in soils in the Pine Point region.

Sampling was conducted in July and August 2009, and employed a Katlodeeche First Nations youth member for two days of environmental monitoring experience. Surface soil samples (0-15 cm) were collected at 14 evenly-spaced sites along the railbed. Zinc concentrations both on and next to the railbed were above the soil quality guidelines set for industrial use (360 mg/kg) at 8 sites closer to the abandoned mine. Lead concentrations were above the guideline value (600 mg/kg) at 10 sites on the railbed, also closer to Pine Point, but all samples taken next to the railbed were below the guideline value. Hydrocarbons were below detection limits at all 5 sites that were analyzed.

Background concentrations of zinc were less than 300 mg/kg, and were less than 55 mg/kg for lead, in surface soils collected at four control sites in the Pine Point region. This indicates that the higher levels of lead and zinc noted on and adjacent to the railbed are likely related to historic dust deposition rather than naturally high levels of lead and zinc in surface soils.

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Location: Close to Daring Lake, Gordon Lake, Snap Lake, Contwoyto Lake and Tibbitt Lake

Bioaccumulation of brominated flame retardants, currently used pesticides, and emerging metal trends in the vegetation-caribou-wolf food chain

This project studied the bioaccumulation of different classes of contaminants in a northern food-chain: vegetation – caribou – wolves. Previously, it was found that perfluorinated compounds bioaccumulate in this food chain. The contaminants that were investigated in this study included brominated flame retardents (BFRs), currently used pesticides (CUPs), and metals.

Sample collection was carried out in collaboration with the Department of Environment and Natural Resources (ENR). Vegetation samples were collected from the range of the Bathurst caribou herd in south eastern NWT and north western Nunavut. Bathurst caribou and wolf body tissues were collected by ENR biologists. The samples are currently being analysed.

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Location: Délı̨nę

Contaminants in fish in the Keith Arm of Great Bear Lake

A study was conducted in February 2009 to collect and analyse tissues from fish in the Keith Arm of Great Bear Lake, offshore from Déline. The objective of the study was to collect lake trout, whitefish and herring, and to analyse muscle and liver samples for a broad spectrum of industrial contaminants and naturally-occurring compounds.

The study began with discussions with fishers in the community and the Déline Renewable Resources Council about methods of obtaining lake trout, whitefish and herring from offshore. Fishers indicated that lake trout were very scarce and that very few were being collected in gill nets. Baited long-lines were set by noon on February 19, but no trout were caught by the night of February 20. Samples of muscle liver and aging structures (otoliths) were taken from a total of 16 herring and 12 trout caught by fishers in the community, and analysed at commercial laboratories for metals, radionuclides and organochlorine pesticides. All contaminant levels were considered to be low in all fish, but in particular, radionuclides (Radium-226 and Lead-210) were at or below detection limits in all fish. Some organochlorine pesticides were detected in muscle but the concentrations were considered to be low.

This study concluded that fish remain an important nutritious component of country food diets around Great Bear Lake.

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Location: Rayrock Mine

2009 monitoring program of Rayrock mine site

The 2009 Rayrock long-term monitoring program involved five key components; visual inspection of the decommissioned mine (adit/shaft caps) and tailings areas, radiation dosimetry, radon gas surveys, surface water sampling, and groundwater sampling.

The visual inspection indicated that the adit and five sealed vents are in good condition; however, it was recommended that maintenance work on the north and south tailings caps be completed to prevent erosion. Dosimetry surveys of the north and south tailings areas confirmed the continued performance of the silty/clay tailings caps. However, elevated dose equivalent rates at the cap margins support the need for future maintenance work. Radon measurements indicate high variability in radon concentrations within and between sites since 2002. Surface water samples suggested that there were no increases in contaminants in the monitored lakes; however, contaminants have exceeded national guideline values in several lake monitoring locations throughout the monitoring years. The greatest concentrations of contaminants were observed in Mill Lake, Mill Stream and Gamma Lake. Many of the groundwater wells are no longer functioning, and there was high variability observed in the groundwater contaminant datasets as a result of surface water and sediment contamination.

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Location: Délı̨nę, Tulıt'a

Arsenic sequestering in wetlands adjacent to the Terra Mine tailings lake, Northwest Territories

Fieldwork was done during the summer of 2009 at the Terra Mine site, located east of Great Bear Lake along the Camsell River system in the Northwest Territories. This work was carried out by a researcher from Queen's University, along with the Indian and Northern Affairs Contaminants and Remediation Directorate.

Arsenic is a natural element that is present in the rocks at Terra Mine. This arsenic-rich rock material was taken from the mine and put in Ho-Hum Lake after the silver and copper were removed. Because of this, the water in the lake has high levels of arsenic in it, which can be harmful to fish and animals.

The purpose of this project was to study whether arsenic is being taken out of the water and stored in the sediments as water flows through a wetland downstream of Ho-Hum Lake, and whether this process can be used as a reliable and permanent remediation method for arsenic in the water. The field season at Terra Mine gave enough opportunity to look at the wetland, and to collect enough water and sediment samples, to study what is happening to the arsenic in the wetland.

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Region: NS **Location:** Rayrock Mine

Rayrock Mine supplemental environmental site assessment

SENES Consultants Limited (SENES) was contracted by the Indian and Northern Affairs Canada (INAC) Contaminants and Remediation Directorate to conduct a Supplementary Environmental Site Assessment at the decommissioned former Rayrock uranium mine. The Rayrock mine had been remediated in 1996 by the federal government, and has been monitored by INAC under a long-term monitoring plan. The SENES 2009 Supplementary Environmental Site Assessment was conducted to fill site data gaps and assess if the work done during remediation was effective, complete, and still in good condition.

Assessment work was carried out at the former Rayrock uranium mine from September 21st-23rd, 2009, and included: visual inspections of mine and camp areas, characterization of any hazardous materials, selected water quality sampling, soil/wasterock/tailings sampling, and a comprehensive terrestrial gamma radiation survey. All samples were collected manually, and with minimal impact to the environment. The field programs were conducted with technical assistance (wildlife monitoring and field support) provided by Aboriginal Engineering, a Tlicho-owned company.

While the remedial work was found to be generally in good condition, the assessment identified several residual issues that warrant further consideration. These environmental issues were limited to the mine and tailings sites, and were determined to have minimal effects on the surrounding land and water systems. Potential remedial options were developed by SENES for INAC site management consideration.

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Region: SA **Location:** Délı̨nę

Contaminated sites field sampling follow-up - Great Bear Lake sites

SENES Consultants Limited (SENES) was commissioned by Indian and Northern Affairs Canada (INAC) to conduct environmental assessments and monitoring at several former mine sites within the Great Bear

Lake region. Two projects were completed by SENES during the 2009 field season: long-term monitoring at the now remediated Port Radium Mine, and continued monitoring/assessment at Contact Lake Mine, Silver Bear Mines, and the Sawmill Bay site.

The second year of the Port Radium Long Term Monitoring Program was completed in two phases: a spring inspection of the condition of remedial structures (e.g. mine caps, covers) and spot gamma radiation measurements, and a fall campaign that included both physical inspections and radiological measurements, as per the spring inspection, as well as water sampling in Great Bear Lake, Cross Fault Lake, Glacier Lake and the Mcdonough Tailings Containment Area. The remedial structures and features were found to be in good condition, and measurements of gamma radiation were consistent with those measured in 2008. Water quality was unchanged since 2008, and was generally similar to background levels.

Fish, water, benthic invertebrates, soil, and vegetation samples were collected at the Contact Lake Mine, Silver Bear Mine, and Sawmill Bay sites for the 2009 Great Bear Lake Sites Baseline Monitoring Program. Environmental impacts were noted in locations associated with tailings ponds, dumps, and fuel storage areas. Impacts were generally limited to small areas, and minimal effects on the surrounding land and water systems were noted. The results of this monitoring program will be used to help develop a plan to remediate these sites.

The program was successfully completed with technical and logistical assistance provided by members of the Déline community. All monitoring work was completed with minimal impact to the environment, as no heavy equipment was required and all waste generated was removed from the sites.

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Location: Outpost Island Mine site (Outpost Island East and West, east arm of Great Slave Lake, 88 km southeast of Yellowknife; Lat: 61.73, Long: 113.45).

Phase III environmental site assessment - Outpost Island Mine

Franz Environmental Inc. completed a Phase III Environmental Site Assessment (ESA) at the abandoned Outpost Island Mine. The Outpost Island mine site is located approximately 88 km southeast of Yellowknife, NT and occupies two islands. The field program was conducted from July 27 to August 1, 2009.

The main issues at the Outpost Island Mine are petroleum hydrocarbon impacted soil and the impacts of metal on soil and sediment. The tailings pile and waste rock areas were delineated and sampled. Both may pose a risk to the near shore environment of Great Slave Lake; however, based on the size of the lake, drainage will eventually be diluted, which will reduce the surface water concentrations to below guidelines. Submerged tailings piles were located in the bays surrounding Outpost Island, specifically to the north, south, northwest, and east.

Waste materials were inventoried, building dimensions recorded, and waste dumps delineated. Most waste materials were non-hazardous (i.e. unpainted wood and scrap metal). The site was mapped and background environmental data were collected. Details will be presented in the final report submitted to INAC-CARD in March, 2010.

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Location: The abandoned West Bay mine site is located on the east side of Gordon Lake, approximately 80 km northeast of Yellowknife.

Phase III environmental site assessment - West Bay Mine

The West Bay Mine is located on the eastern side of Gordon Lake approximately 80 km northeast of Yellowknife. Between 1947 and 1948, an open pit mine operated at the site. Trenching and diamond milling were conducted, and the ore was reported to have been processed on site using a mercury amalgamation process in a small mill. A second round of open pit mining occurred during 1990, with ore from the site trucked to Yellowknife for processing in 1991. No further mining activities have occurred at the site since 1991.The objective of this Phase III assessment project was to determine the current environmental and physical condition of the site, in support of a future remedial action plan and remediation specifications for the site.

The Phase III program collected additional subsurface information to delineate the impacted areas that were identified in the 2008 Phase II Environmental Site Assessment. In addition, a geochemical survey of the waste rock and tailings was completed.

Neutralization Potential/Acid Potential ratios measured in waster rock samples indicated a range in potential for acid rock drainage (ARD) formation, from low potential to extremely likely to generate ARD. The field program confirmed that tailings, containing metals in excess of the Canadian Council of Minsters of the Environment criteria, had been deposited on the ground surface and erosion had migrated the tailings downhill into Gordon Lake. Analyses of the tailings indicated that they that they are very likely to produce ARD.
It is estimated that a total of 14.3 tonnes of non-hazardous materials have been left onsite and hazardous wastes were limited to 100 L of oil in one abandoned drum and 3 lead acid batteries. Due to the proximity of the Site to the Tibbett Lake Winter Road, it is recommended that the remedial contractor mobilize/demobilize to the site during the winter trucking season.

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Location: Wekweètı

Phase III Environmental Site Assessment at the Spider Lake Mine, Northwest Territories
The objective of the seabed mapping program is to conduct a regional survey of the Beaufort shelf. Ice scouring processes, benthic habitats, abandoned artificial islands, pingo-like features, gas seeps, seafloor foundation conditions, and subsea permafrost will be investigated.

The Coast Guard vessel CCGS Nahidik will be used as the research platform to conduct offshore acoustic/sonar surveys of the seabed, as well as a regional grid of survey lines first surveyed in the1980's. Will be resurveyed as follows:

a. use a 300kHz short range multibeam echo sounder (Simrad EM 3002) to produce 200m wide, along track maps of the topography and character of the seabed. Additional multibeam data will be collected at specific sites on the central shelf. The multibeam system is operated from a 9m long survey launch deployed daily from the Nahidik.

b. use a 100 kHz sidescan sonar (Klein 3000) to map the distribution of ice scours on the seabed for comparison to historic data and to calibrate the multibeam data

c. use a single beam 200 kHz echo sounder to map the depths of ice scours on the seabed and to calibrate the multibeam sonar

d. use 1.0-3.5 kHz subbottom profilers (boomer, sparker) to map the distribution of sediments to 200m below seabed along repetitive grid lines and at specific sites (mud volcanoes, gas vents, artificial island, permafrost, habitat sites)

e. use a drop camera and a bottom towed video camera to photograph the nature of the seabed and benthic habitat

Sea-ice and sea-state conditions and the distribution of marine mammals will control the access to research sites on the shelf in any one year.

Through the Joint Secretariat and Aurora College, two northern community students will be employed during the Nahidik program survey. Students will participate in field program activities on board CCGS Nahidik. Students will be assigned projects related to their interests (marine biology).

Communication of results occurs through annual consultation with each of the six communities. For example, in February 2009, a team of Nahidik scientists met with members of the HTC's in Inuvik, Aklavik, Tuktoyaktuk, Sacks Harbour, Paulatuk and Ulukhatok to present the results of the 2008 research program, discuss plans for 2009 and to solicit Traditional Knowledge input into research activities.

The fieldwork for this study will be conducted from August 24 to September 12, 2009. The survey area includes the Canadian Beaufort continental shelf and is bounded by 131°00' to 141°00'West longitude and 69°30' to 71°00'North latitude. Exact locations to be surveyed on the shelf in any one year are dependent on weather and sea-ice conditions as the vessel is not ice strengthened.

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Location: Fort Liard , Nahanni Butte, Trout Lake

Land use and regulatory permitting - Trout Lake Airport
The objective of this study was to determine a general inventory of the physical features of the proposed project site for the relocation of the Trout Lake Airport. The focus of the study was primarily on the wildlife, vegetation, and proximity to the community of Trout Lake, NT. This study was undertaken as required by a land use permit application, submitted to the Mackenzie Valley Land and Water Board.

The methodology of the project was primarily visual observation and written recordings of findings at the proposed project site. The site visit and study took place over the duration of two days in July 2009. Face to face consultations with local band leaders and the community were also held. A summary of the study's findings include:

- 36 vegetation species were identified at or near the study area
- Black bear, deer, moose, rabbit, and fox have been observed near the study area
- Woodland caribou have not been seen in the study area in several years
- A relocation of the airport will result in a reduction to the level of noise exposure to the community
- There are no known burial sites within the reserve airport site
- There are no known archaeological sites within 150m of the proposed project area

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Location: Colville Lake

Land use and regulatory permitting - Colville Lake Airport
The objective of this study was to determine a general inventory of the physical features of the proposed project site for the relocation of the Colville Lake Airport. The focus of the study was primarily on the terrain, vegetation, wildlife and proximity to the community of Colville Lake, NT. This study was undertaken as required by a land use permit application, submitted to the Sahtu Land and Water Board.

The methodology of the project was primarily visual observation and written recordings of findings at the proposed project site. The site visit and study took place over the course of two days in August 2009. Face to face consultations with local band leaders and the community were also held. A summary of the study's findings include:

- 47 vegetation species were identified at or near the proposed project site
- The study area was not frequently used for hunting purposes
- Rabbits, martens, moose, and muskox have been observed near the study area
- Spruce grouse, ptarmigans, crows, ravens, and seagulls were present
- Caribou is no longer hunted nearby, since their migration has shifted approximately 20km from the community
- There are no known burial sites within the reserve airport site
- There are no known archaeological sites within 150m of the proposed project area

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Ogruknang drilling field assessment

On behalf of MGM, representatives of KAVIK-AXYS Inc. conducted a biophysical study in July 2009 in the Ogruknang area, north of Inuvik, NWT, near Reindeer Station and the Ikhil gas plant. This area was identified as a potential drilling site in a proposed winter drilling program. The locations of potential wellsites and access roads were examined to determine if sensitive biophysical resources may potentially be affected by winter drilling activities.

No rare plant or uncommon vegetation communities were located during the surveys. The vegetation communities encountered were typical of those expected in the upland tundra and the inner Mackenzie delta. The landscape transition from the upland tundra to the lowlands of the inner Mackenzie delta creates what is known as the Caribou Hills. This transition area, where potential access roads would be located, has conditions for vegetation growth, species and community composition which are more uncommon in the region, particularly due to the exposed substrates. However, these exposed substrates are not along the path of the proposed access routes or present at the potential wellsites. No incidences of rare vascular plants or uncommon vegetation communities were recorded.

Incidental wildlife observations and habitat assessments found the area supports key waterbird nesting and foraging habitat. Portions of the area surveyed provide suitable mammal foraging habitat for barren-ground caribou, grizzly bear and moose. No wildlife signs or sightings were observed at two proposed wellsites, and many arctic terns, an arctic tern nest and grizzly bear scat were observed at one proposed wellsite. No wildlife species or signs were observed along either proposed access route, although one potential access route is in an area that provides key denning habitat for grizzly bear and meso-carnivores.

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Wind energy monitoring in Norman Wells 2009-2010

Data was collected from the Norman Wells wind energy monitoring tower and downloaded for analysis. Results will be published in both technical and plain-language reports and distributed to the community at a later date.

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Region: IN, GW **Location:** Inuvik

Environmental screening of the Inuvik Airport runway extension

The Government of the Northwest Territories has proposed to extend the length of the existing runway surface at the Inuvik Airport from 6,000 to 9,000 feet. Research was conducted to fulfill the requirements of an Environmental Assessment screening, pursuant to the Canadian Environmental Assessment Act. The objective of this study was to determine a general inventory of the physical features located adjacent to the airport, primarily the terrain, vegetation, and wildlife.

Research methodology included a two day site visit, mainly for observations and written recordings in the proposed development area. Airport staff accompanied site researchers. Main findings from the research include:

- Surface water resources on the site include lowland areas and small drainage channels running in a southeast direction
- Dominant vegetation consists of open, stunted stands of black spruce and tamarack and occasionally white spruce. Dominant shrubby understory layer consists of dwarf birch, willow, crowberry and alder. The herb and bryophyte layers were dominated by cottongrass, lichen and peat moss
- 10 species of mosses/lichens, 23 species of herbs, 4 tree types and 14 shrub species were observed within the study area
- No fish or fish habitat in the study area
- Sandhill cranes and songbirds were observed throughout the area; however, the study area is not known to, or expected to, serve as valued habitat for migratory birds. Spruce grouse, a resident bird species, were also observed.

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Region: NS **Location:** Yellowknife

Wind Energy Monitoring at Thor Lake 2009-2010

The objective of this wind monitoring project is to quantify the wind energy potential for the economic feasibility of installing a wind turbine as a part of the Avalon Rare Metals Inc. development near Thor Lake. A mine is expected to be built in the next few years and will employ 100 people. There will be a mine, a mill, and a camp, and the operation is expected to demand 5 to 10 MW of electric power, which will likely come from diesel and possibly hydro and wind.

Therefore, in September 2009, a 50m wind tower, equipped with anemometers, a wind vane, and temperature sensors, was installed near the Thor Lake site, along the Hearn Channel. Data files from this study site were downloaded monthly for one year. Data management and reporting is maintained by the Aurora Research Institute staff in conjunction with the project engineer. The results of this study are forthcoming.

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Region: IN, GW, SA, DC, NS, SS

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Location: Participants will complete the questionnaires in the time and place of their choice throughout the Northwest Territories.

Role perceptions of nurse practitioners in regard to caring for persons with mental illness

Research surveys were sent to nurse practitioners (NPs) across Canada, including NPs in the Northwest Territories and Nunavut, between June and October 2010. The total response rate was 53%. The results are currently being analyzed, and it is expected that the study will be completed in the fall of 2010. The results will be sent to the Registered Nurses Association of Northwest Territories and Nunavut, published in nursing journals and presented at nursing conferences where applicable. The results will be presented to the research funding agency, MindCare New Brunswick, and also will be made available to anyone who requests a copy.

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Location: Aklavik

Climate as a health determinant in the Aklavik region of the Northwest Territories

This project (the Climate Change Project) was a youth driven, community based research project which followed a 2006-07 youth & elders dietary pilot project. The pilot project was designed to engage Aklavik youth in examining dietary choices and diet-diseases relationships at the community level. The community of Aklavik , NT was engaged in the Climate Change project in many ways: the Aklavik Health Committee guided the project; community members concerned about community health issues were involved; the staff and students of Moose Kerr school were involved through a specific curriculum; an on-the-land retreat took place and a video was produced; and elders from Aklavik and the surrounding area participated by sharing traditional knowledge and applying past events to current understandings and adaptations to climate change.

The research was integrated within the current science curriculum at the Moose Kerr School with the project running in three phases. The first encompassed the collection of information related to climate change and health determinants, as well as an on-the-land retreat to collect information. The second phase included synthesis of the information with video methodologies, and the final phase included dissemination of the findings.

A major outcome of the project was a heightened awareness of the research process within the community and region. The project brought together elders and youth, and it connected western science (through the science curriculum) with the traditional knowledge of the Inuvialuit and Gwich'in regions. The information has been synthesized and discussed in the classroom. A thirty minute video was produced, and premiered in Aklavik on Aboriginal Day (June 21, 2009).

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Region: IN, GW **Location:** Aklavik, Inuvik

Health and healing in Aklavik, NWT: an ethnohistorical review
In November/December 2009, 17 elders in Aklavik and Inuvik, NWT shared stories about life in the 1930's through to the 1960's. They talked about what Aklavik was like before Inuvik was built and what it was like when the government tried to close Aklavik. Elders talked about being healthy and about caring for their families. They talked about taking care of children. They talked about working and living on the land and about working and living in Aklavik.

Elders talked about how Aklavik's motto "Never Say Die" really meant a lot to the community. They hope that the younger generations will remember this motto. The motto means standing up for your rights, for your community. Being healthy also involves these things: remembering language, knowing how to hunt and trap, knowing how to sew and cook, and knowing traditions. People talked about how important it is to take care of each other, that people are loved and appreciated.

Elders hope that the younger generation will learn from their experiences. Elders hope that Aklavik will always be a good place to live.

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Healthy foods north intervention project
From 2008-2009, the Healthy Foods North (HFN) program ran in three communities in the NWT. Local community members were trained to put together events and activities to raise awareness of healthier food and lifestyle choices. They created healthy eating displays, and posted shelf labels, flyers and posters in stores. HFN staff also organized healthier eating presentations, cooking classes, nordic walking clubs, pedometer challenges, community feasts, and radio stories. Every activity was evaluated to determine if it was helpful for community members. Nutrition and physical activity data was collected in the communities before and after the program took place.

Early results show members of HFN communities lost weight and were eating fewer calories and greater amounts of vitamins A and D, after the program ended. HFN has affected public health policy and is now a part of the NWT Foundation for Change Action Plan 2009 – 2012. HFN has become a positive example of lasting health promotion programming. HFN makes healthier living and eating education culturally fitting, while improving aboriginal health.

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Healthy Foods North intervention project review

The purpose of the Healthy Foods North intervention project review was to describe and better understand the partnership between the Healthy Foods North program and the retail/food sector, such as barriers to implementation and project successes. To this end, telephone interviews were conducted with 18 individuals including Healthy Foods North workers and store managers in Inuvik and Tuktoyaktuk. The interviewees felt that Healthy Foods North is not only culturally appropriate but that it addresses specific community needs. Most importantly, the involvement of the communities in the development of the program contributed to its success. The visibility of Healthy Foods North within the communities, an increased awareness of healthy food choices, and an increased demand for healthy foods in the stores are also major successes of the project. The potential of Healthy Foods North to translate into lifestyle change and improved health outcomes is a key strength of the project, as is a long-term decrease in the occurrence of some chronic diseases including diabetes and heart disease. There is a willingness among retail and community partners to continue working with Healthy Foods North. However, sustainable funding as well as local sponsors are needed to keep the project in the communities.

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The Aklavik H. pylori project

The Aklavik H. pylori project was conducted with guidance from the Aklavik Health Committee. Since November 2007, 368 participants have enrolled, 313 had a breath test for H. pylori infection and 58% of those tested were positive. In February 2008, 194 completed a scope test and had stomach biopsies taken. The doctors who did the scope tests observed that 3% had stomach ulcers and 14% had inflammation in the stomach. The pathologist who examined the biopsies observed that 67% had H. pylori, and among those with H. pylori, 43% had severe inflammation and 20% had damaged glands (atrophy). This level of severe inflammation of the stomach was much higher than that observed in Edmonton. The prevalence of H. pylori infection was higher among those who had a scope test because participants who had positive breath test results were more likely to have the scope test. Since April 2008, 167 participants and 94 households have completed epidemiology surveys. In 2008, 111 participants with H. pylori infection enrolled in a treatment trial and 83 have had a breath test after treatment to see whether the treatment worked. A documentary was created to communicate the results of the project with the community.

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Youth and tobacco studies with the Yellowknives Dene first nations
Data was collected in partnership with the K'alemi Dene School in Ndilo, from March through May 2009. Students in the Grades 9-12 class received basic training in research objectives, ethics and procedures. These students developed a list of questions that were used in preliminary interviews with other students from Grades 2-12. As part of these interviews, the student researchers were briefed on using disposable cameras to take pictures of tobacco use in their community, which is a research procedure called PhotoVoice. When the pictures were developed, the student researchers again conducted a short interview to discuss the pictures, using a set of questions developed with the class. They also collected this information from students at Kaw Tay Whee School in Dettah. The results of all the interviews were then put together and summarized for presentation back to the schools in October. The preliminary results were also presented at the 14th International Congress of Circumpolar Health in July 2009 in Yellowknife. Additionally, after working with a K'alemi student, an eBook of the PhotoVoice results has been prepared and will be distributed to students and the community at the K'alemi School Health Fair on January 22, 2009. Follow-up activities are under discussion with the research team.

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Cultural safety: respecting aboriginal perspectives in a health care setting
This research study was done to provide the Yellowknife Health and Social Services Authority (YHSSA) information as to whether local Dene and Métis populations in Yellowknife, NT, are content with the care they receive at Yellowknife community health care clinics. YHSSA service providers were also interviewed on their training and perspectives on offering care to Dene and Métis peoples in Yellowknife. A total of twenty-one interviews were conducted through focus groups and one-on-one interviews.

The study revealed that Dene and Métis participants are satisfied with the care they receive from YHSSA, however, it is clear they want more acknowledgement, input, and representation of their cultures in the way services are delivered in Yellowknife medical clinics. Some examples are offering language services in medical clinics, having more aboriginal receptionists, respecting Elders and offering tea, offering holistic care, having a cultural liaison person in government, and offering cross-cultural training to service providers. The service provider interviews revealed they are open and willing to learn about aboriginal cultures in order to provide optimal care to aboriginal peoples. They also discussed that trust was a major factor while interacting with their aboriginal patients and that it sometimes takes a long time for them to open up.

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Changing the "culture of smoking": community-based participatory research to empower Inuvialuit communities

This community-based participatory research (CBPR) project began in Aklavik and Ulukhaktok, NWT, in 2007. In late 2007 and early 2008, tobacco use baseline surveys were developed. CBPR team members completed the surveys in late 2008, with a total of 201 surveys from both communities. Local teams completed data entry during early 2009, and datasheets have now been checked before the data is analysed. As soon as possible, local teams will share a summary of baseline survey results with their communities.

Detailed plans for training to be done in 2010/11 were developed: “Helping Smokers Heal” is a course to train smoking counsellors and “Smoking Sucks!” is a workshop for youth to facilitate tobacco reduction initiatives with their peers.

The project team was invited to facilitate a workshop about CBPR at the International Congress on Circumpolar Health in Yellowknife, July 2009, but were unable to participate. Instead, the CBPR team presented a poster entitled “Using Community-based Participatory Research for Tobacco Control in the Arctic” at the 6th National Conference on Tobacco or Health in, Montreal, November 2009.

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Hypertonic saline for the treatment of bronchiolitis

No research was conducted under this licence.

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Location: Aklavik, Inuvik, Ulukhaktok, Sachs Harbour, Tuktoyaktuk, Paulatuk, Fort McPherson, Tsiigehtchic

Enhancing existing community health capacity and infrastructure by focusing on the integration of Inuvialuit, Gwich'in, and western medicine approaches to palliative care

The current practice of implementing western health practices in northern aboriginal communities has not promoted the development of community specific practices identified by the community, for the community. End of life care is a difficult practice for many health professionals, especially when providing care in a cultural context foreign to their own culture and beliefs.

Funded by the Aboriginal Health Transition Fund, a study in traditional end of life care was completed in eight Inuvialuit and Gwich'in communities in the Beaufort Delta Health Region. Seventy interviews were conducted. From the data collected, community specific educational resources for health professionals and community members have been developed.

The end of life resource for community members includes information about: what is end of life care; who is involved; how do we get started; meeting with health providers; what is a care program; what to expect from health providers; available home care equipment; care options; important discussions for the family; grieving; and additional resources.

The health provider educational guide includes: community; background information; traditions and beliefs; beliefs surrounding palliative care; beliefs surrounding passing on: family involvement; family concerns (potential); things to consider (preplanning, communication, effective behavior); trust and respect; and some basic translations.

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Recent changes in carbon source-sink relationships and greenhouse gas emissions in forest and peatland ecosystems along the Mackenzie Valley region of Canada

The Mackenzie Valley region in north western Canada has undergone the most warming (1.7ºC) in Canada over the last century. The soils in northern permafrost regions contain large amounts of organic carbon (C) and methane locked in the permafrost, and as the climate warms, the thickness of the active layer (depth of surface soil thaw in the summer) exposed to decomposition and methane production increases, enabling trapped methane to escape. Consequently, warming of permafrost soils could increase greenhouse gas [carbon dioxide (CO_2) and methane (CH_4)] emissions to the atmosphere.

In the spring of 2007, four intensive monitoring sites were established throughout the Mackenzie Valley and northern Alberta, with locations in the regions of Inuvik, Norman Wells, Fort Simpson, and Fort McMurray. Two or three plot locations at each site allowed for investigation of upland forests and peatlands, both those affected by permafrost (peat plateaux) and areas where permafrost has thawed (collapse scars). Measurements included tree, shrub, herb and ground layer species composition and biomass, soil active layer depth, canopy closure, lichen biomass measurements and soil and water chemistry measurements. Measurement of two important greenhouse gases [CO_2 and CH_4] were conducted monthly from May to September 2009.

Early results indicate that the CH_4 release/consumption distribution pattern within the study area is intricate and highly variable, fluctuating with the local hydrology. Carbon dioxide emissions and net ecosystem CO_2 exchange at the ground surface decreased across the climatic gradient from south to north and were mainly affected by soil temperature and the presence of permafrost. Landscape position was another major factor affecting soil respiration rate, which was significantly greater in upland areas than in the peatlands.

Initial results from this study indicated that GHG emissions of CO_2 and CH_4 from soil are likely to increase in regions experiencing a warming climate.

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Beaufort shelf seabed mapping project

In August-September 2009, the Geological Survey of Canada, in collaboration with Imperial Oil Limited, British Petroleum, the Canadian Hydrographic Service and University of New Brunswick, conducted a seabed mapping program from the Canadian Coast Guard vessel NAHIDIK. Research was focused on investigating geohazard constraints to outer shelf-upper slope hydrocarbon exploration. Multibeam sonar, sidescan sonar, subbottom profilers and a high resolution multichannel seismic system were used to investigate seabed stability conditions. Linking the unknown deep water seabed environment to known seabed conditions in the inner shelf was a key objective. Relict ice scours were observed to 80m water depth. Subsea ice-bearing permafrost may not exist beyond 80m water depth. The thickness of low strength sediments was thinner on the outer shelf than the inner shelf, but thickened down slope. Slope stability studies indicated the presence of submarine slumps in the upper slope. Shallow gas vents were not observed, but mud volcanoes and clay diapirs exist below the shelf break at 100m. No encounters with marine mammals occurred during survey operations.

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File No: 12 404 653 **Licence No:** 14454
Region: NS **Location:** Diavik and Lac De Gras Mine Sites

Waste rock studies at a diamond mine site
No research was conducted under this licence.

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Region: NS **Location:** Gamètì, Behchokò, Wekweètì, Whatì, Yellowknife

Aquatic Effects Monitoring Program 2009
The Aquatic Effects Monitoring Program (AEMP) was successfully implemented in 2009. The analysis of effluent and water chemistry data collected during the 2009 AEMP field program, and from relevant stations within the Water License Surveillance Network Program stations, indicated low level effects of the mine on water chemistry within Lac de Gras.

Results of the sediment analysis did not identify conditions that are likely to affect aquatic life through enrichment or impairment. An analysis of the number and types of small organisms that live on the bottom of the lake (benthic invertebrates) indicated a range of mine effects, from no effect to a high level effect, depending on the variable analyzed. Some results are indicative of nutrient enrichment. Findings to date from a special study to examine changes in amount, number and types of tiny animals (zooplankton) and algae (phytoplankton) that live in the water of Lac de Gras indicate a pattern consistent with nutrient enrichment from mine effluent.

The majority of participants in the 2009 Community Based Monitoring of fish palatability rated most of the sampled fish as looking good or excellent, and also believed that they were as good or better than fish they normally captured. Analysis of muscle tissues from ten fish caught in Lac de Gras found mercury levels below Health Canada's guideline for fish consumption.

The weight-of-evidence analysis confirmed a nutrient enrichment effect, and concluded that there is strong evidence for a mild increase in lake productivity, due to nutrient enrichment, and negligible evidence of impairment to lake productivity, as a result of contaminant exposure.

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Location: Ulukhaktok, Sachs Harbour

Melville Island South Ice Cap mass balance & snow pollution

Researchers arrived at the Melville Island South Ice Cap at around noon on Saturday April 18, 2009, via twin otter aircraft from Resolute Bay, Nunavut. The automatic weather station that sits permanently on the ice cap was still standing. The data were downloaded and the instruments lowered, to account for the melting of the ice cap that had occurred the previous summer. Of the 19 mass balance poles that were measured, 6 poles were missing. Four of these poles were replaced with new poles, while the ice had completely disappeared at 2 of the sites. Results indicate that the Melville ice cap had thinned by an average of 905cm from September 2007 to September 2008. This is over 4 times greater than the long term (approximately 50 years) average, and second only to 2007 for the most negative mass balance year, since observations began in 1960.

No wildlife was seen on the ice cap; however, fresh fox tracks were observed near many of the poles. The pilot of the twin otter that picked up the researchers, on Monday April 20, observed approximately 30 musk oxen located approximately 20 km north east of the ice cap.

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Location: Aklavik, Inuvik, Tuktoyaktuk, Paulatuk

Permafrost and climate change, western Arctic Canada

In 2009, research was conducted in the western Arctic during April and July/August.

In April, the ice in Workboat Passage, between Herschel Island and the mainland, was not thick enough to freeze to the bottom.

In July and August, research was conducted on the temperatures in the ice house on Herschel Island. The ice house is a big open chamber in which the air circulates, so it has a different condition from the surrounding ground. Research was also conducted in Paulatuk, where temperatures in the ground were studied. Since 2003, the permafrost has been warming up, both in the ground near Paulatuk and away from the community. The ground is now above -6.0°C.

In the Mackenzie delta area, several days were spent at Illisarvik on Richards Island. A temperature cable was placed in the ground at this site in 2008. Permafrost temperature to 50 m depth was recorded using the temperature cable. In order for the ground to have the temperatures that were measured, it must have warmed over the last 100 years.

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Location: Délı̨nę, Gamètì, Behchokò, Yellowknife

GEM Great Bear magmatic zone/iron oxide copper-gold deposit project
All rocks do not have the same mineral potential, but those between Great Bear and Great Slave Lakes have high potential for multiple metals (e.g., iron oxide-copper-gold (IOCG) deposits). During the summer of 2009, public geoscience research and mapping was conducted by the Geological Survey of Canada (GSC) and the Northwest Territories Geoscience Office, to clarify the mineral potential of some under-explored segments of this area, and to modernize the public geoscience knowledge required for mineral exploration and informed land-use decisions. Collaborations with academia, industry and aboriginal communities had substantial impacts on project results, leading to the hiring and training of First Nations people and the discovery of potential archaeological sites.

Known deposits served as knowledge and logistical hubs for re-examining the mineral potential of the western North Slave Region. Various teams mapped bedrock and surficial materials via helicopter and floatplane, and sampled rock specimens and sandy material (till) for laboratory analysis. The development of new exploration methods was pursued around the known deposits, while predictive favorability maps, as well as a new field thematic mapping approach, were tested, which helped discover new mineral occurrences in areas where none were known beforehand. Parallel to field work, an airborne geophysical survey was flown over part of the study area, which provided legacy (pre-1995) synthesis, and detailed geological maps were processed for publication.

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Electromagnetic studies of permafrost in the Mackenzie Delta

The goal of this research project was to test a way to determine the thickness of permafrost, or any changes in the permafrost, in a low cost and environmentally-friendly manner. Permafrost does not conduct electricity very well, and so it will influence the natural voltages and magnetic fields in its surroundings. Making measurements of the magnetic field and voltages in the ground is, therefore, a way to tell how deep the permafrost extends. It is also a good way to tell if there are any melted zones within the permafrost. However, taking voltage measurements in the snow and ice is quite difficult, and so special equipment had to be tested in order to do that. In total, over three years of fieldwork, we have made measurements at 19 locations along a profile near the Mallik Production and Research well. We made our measurements there so we could compare our results with other types of measurements.

Our information about the permafrost is based on computer model studies using the magnetic field and voltage data we collected near Mallik. Our results compare well with data from industry seismic studies.

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Mackenzie Delta shallow gas and permafrost studies

Permafrost and gas hydrates occurring beneath the Mackenzie Delta and Beaufort Sea shelf have been experiencing warming associated with Holocene climate change and geologic processes, such as glaciation, marine transgression, and lacustrine and fluvial activity. This project attempts to quantify the release of methane from these environments, with special emphasis on the controls of permafrost and gas hydrates. Research conducted in 2009 has documented the geochemical signatures of new gas seeps, indicating both shallow biogenic and deeper thermogenic sources. Data loggers deployed to listen for the sound emitted from two active seeps were successfully retrieved; initial data analyses suggest that the seeps continuously vent methane throughout the year at rates between 0.1 and 0.4 m^3 per minute. New surveys, conducted with a Canadian remote sensing company, were successful, allowing for the identification of new vent sites and demonstrating the potential for regional mapping of gas plumes.

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Yellowknife Gold Project: 2009 hydrometeorological survey

Baseline hydrology and meteorology studies on the Yellowknife Gold Project site began in 2004 by the Hay & Company Consultants, a division of EBA Engineering Consultants Ltd. In 2009, the Tyhee NWT

Corporation continued to conduct baseline environmental studies on this site, as part of the development of a gold mine in the area.

During 2009, two field surveys were conducted. In early June, the following activities were carried out: inspecting hydrometric stations, reinstalling the recording instruments, measuring outlet stream water discharges, reinstalling the evaporation pan, and maintenance of the meteorological station. During the third week of August, the hydrometric stations were inspected and outlet stream water discharges were measured.

The following hydrological statistics are for the 2009 period of record from June 5 to October 8. The maximum recorded discharges at Narrow, Winter and Round Lake Outlets were 108 litres per second (l/s), 72 l/s and 29 l/s, respectively. The peak discharges were the result of a large precipitation event occurring June 22, 2009.

The average daily total discharge for the Narrow Lake outlet was 3,435 cubic metres a day (m^3/day). The average daily total discharge for the Winter Lake outlet was 1,890 m^3/day.

The average daily total discharge for the Round Lake basin was 663 m^3/day.

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Matthews Creek 2009 hydrometeorological survey
During the summer of 2009, three visits to Matthews Creek were made. The first occurred on June 30, for the purpose of re-installing the hydrometric instrumentation and collecting further stage-discharge information for Matthews Creek. The meteorological station was inspected and maintenance was performed, including downloading the meteorological data recorded over the winter period (September 2008 to June 2009). The tipping bucket precipitation gauge, which had been repaired on-site after it had been damaged by wildlife late in the fall of 2007, was replaced with a new unit and the fluids were replaced.

The second site visit occurred on August 3. Meteorological and hydrological data were downloaded from the loggers and further stage-discharge measurements were recorded on Matthews Creek.
The third and final visit for 2009 occurred on September 16. During this site visit, precipitation gauge fluids were changed, in preparation for the winter snowfall, and the meteorological station data was downloaded. Further stage-discharge data were also collected. This visit was concluded by removing the data logger and pressure transducer, in order to avoid damage to the instruments during the winter freeze-up.

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Deltaic lake sediments as recorders of past carbon export from arctic river drainage basins

The goal of this research project was to examine the behavior of the Mackenzie River over the last few hundred to few thousand years. The motivation for this work stems from the anticipation that climate change will alter the amount of freshwater and sediments discharged by the river, with consequences for regional ecosystems and for the communities that depend on these ecosystems.

The research approach is to use sediments that accumulate on the bottom of lakes within the Mackenzie Delta as records of past river discharge. Preliminary results for sediment core samples collected in 2007 from a single lake indicated that they contain a detailed history of river input. However, the Mackenzie Delta is an ever-evolving system, with many thousands of lakes, so it is important to determine whether different lake sediments tell a similar story.

In 2009, sediment cores were collected from 20 lakes located in different regions of the delta. Although some lakes in the delta are short-lived, existing for less than 250 years, others remain active for almost 1000 years. In general, the sediments paint a coherent picture, suggesting that they reflect delta-wide depositional processes. Overall, sediments in the Mackenzie Delta lakes appear to hold great promise for the development of a detailed history of past Mackenzie River discharge, stretching back several thousand years.

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Environmental change in the western Canadian Arctic islands

Two related field projects were conducted on Banks Island from June 22 to August 12, 2009. These studies aimed to clarify the natural history of Banks Island, by investigating late Quaternary glacial and sea level history. One party (Lakeman) was based on both the west and east coasts of Banks Island, with camps at Storkerson Bay (June 22 to July 10), Burnett Bay (July 10 to 26), and Jesse Bay (July 26 to August 12). The second party (Vaughan) was situated at Masik River (June 22 to July 6), De Salis Bay (July 6 to 22), and Cardwell River (July 22 to August 4). These studies surveyed glacial landforms and raised marine sediments, to constrain the history of glaciation and relative sea level change in the western Canadian Arctic. Several samples of fossil molluscs and driftwood were collected from the deposits and are in preparation for radiocarbon dating. In addition, rock samples are being analyzed for cosmogenic exposure age dating and U-Pb zircon dating. These data will enable a reconstruction of past environmental variability, which will place modern changes in an accurate temporal context, thus making it possible to discern the significance of future climatic and environmental changes in the Arctic. This project will continue in 2010, with surveys of the northwest and southern coasts of Banks Island.

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Assessing snowpack water equivalent distribution in the Exeter-Yamba-Daring Lake catchment, Coppermine River basin, NWT, for passive microwave algorithm development and stable isotope analysis

The research objectives of this project are to: 1) improve national snow water equivalent (SWE) monitoring capabilities, by acquiring the necessary data to develop accurate, remotely sensed, passive microwave estimates in the spatially expansive and persistently snow covered arctic tundra environment; and, 2) to understand and quantify the spatial and temporal contribution of snowmelt water to surface water bodies from the start of spring-melt through to fall freeze-up.

Fieldwork was conducted from April 7 to April 20, 2009, out of the Daring Lake Tundra Ecosystem Research Station. Fieldwork was carried out by snowmobile along transects that have been sampled since 2004. The study site includes the terrain covered by one Special Sensor Microwave Imager (SSM/I) satellite pixel (25 km x 25 km). Within this terrain a digital elevation map was created, which assists in delineating representative sampling points along a grid. At each of 200 sampling points, the research team would: dig a snowpit; quantify the individual strata by measuring their depths; determine the density and snow grain crystal size; take 30 measurements of snowdepth within a 100 m^2 area and record the slope; determine the aspect; and make note of the nature of the terrain (e.g., bouldery, significant vegetation). Finally, samples were taken in order to measure ionic and isotopic chemistry. Recent work has resulted in the development of algorithms relating satellite passive microwave radiation data to SWE. Continued collection of SWE data at this site enables us to quantify the range of snow conditions and how that difference is reflected in passive microwave radiation signatures in the SSM/I satellite. Being able to quantify the actual range of SWE on the tundra, and relating this to the passive microwave data, strengthens the application of the method.

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Location: Aklavik, Inuvik, Tuktoyaktuk

Influence of Mackenzie Delta channel thermal regime on permafrost

The Mackenzie Delta, which is over 13,000 square kilometres in size, has more than 45,000 lakes and many small rivers. Almost half (40%) of the delta surface is covered by water. This means that the ground temperature, which is usually below freezing (0°C) this far north, is actually kept above 0°C in many places by the surface water. The goal of this project was to learn how warm lakes and channels in the delta become during the summer. In June 2009, underwater devices that record temperature every four hours were installed at the bottoms of 13 channels and 17 lakes throughout the delta. Between June 10 and August 25, channels averaged 15°C, and lakes averaged 14.5°C. At all channel sites, water temperatures were the same from the surface to the bottom, and from one bank to the other. Channel and lake temperatures peaked near 20°C on July 31, and then decreased more quickly than they had increased. There was greater variation, or bigger differences,in temperature between lakes than between channels. Air temperature, device installation depth, and site latitude all seem to affect water temperature.

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Region: IN **Location:** Ulukhaktok, Sach Harbour, Tuktoyaktuk, Paulatuk

ArcticNet: An integrated regional impact study of the coastal western Canadian Arctic
Since 2004, ArcticNet has been using the Canadian research icebreaker CCGS Amundsen to carry out sampling operations in the Beaufort Sea/Mackenzie Shelf/Amundsen Gulf region as part of its ongoing marine-based research program. The central aim of this research program is to study, on a long-term basis, how climate-induced changes are impacting the marine ecosystem, contaminant transport, biogeochemical fluxes, and exchange processes across the ocean-sea ice-atmosphere interface in the Canadian Arctic Ocean.

In 2009, sampling operations in the Beaufort Sea/Mackenzie Shelf/Amundsen Gulf region were carried out from the CCGS Amundsen from July 11 to October 14. During these 95 days, researchers sampled at over 140 oceanographic stations. Sampling operations included deployments of: a CTD-Rosette, a box corer, a piston corer, an Agassiz trawl, a Remotely Operated Vehicle, plankton nets, a total of 13 sub-surface oceanographic moorings, and 12 moored hydrophones. Additionally, a multitude of oceanic and atmospheric parameters were measured continuously using the Amundsen's array of continuous samplers (i.e., SM-ADCP, EK-60 scientific echosounder, water surface pCO2 and CTD on track system, foredeck and top bridge meteorological towers, ceilometers, radiometer and all-sky camera). The ship's EM302 multibeam sonar and Knudsen sub-bottom profiler collected over 7,000 km of high resolution bathymetry and sub-bottom data. On the bridge, hired Inuvialuit Marine Wildlife Observers spotted and identified marine mammals and seabirds.

Data collected from this multi-year program will contribute to a better understanding of the impacts of climate variability and change on the physical, biological and geochemical processes in the Beaufort Sea/Mackenzie Shelf/Amundsen Gulf region.

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Controls on carbon and nutrient cycling in arctic tundra

The following report outlines the progress that was made during 2009, according to some of the specific research questions that were outlined in the original application for this project:

Q1. *What is the significance of biogeochemical processes during winter and spring-thaw to overall annual nitrogen cycling in tundra ecosystems?* The spring thaw period is one of very dynamic changes in soil nutrients, as a result of impacts on the soil microbial community. Deeper snow increased the magnitude of these fluctuations and, therefore, may influence the distribution and growth rates of plant species across the tundra landscape.

Q4. *What is the outcome of tundra plant-soil microbial competition for nitrogen over the 5-10 year time scale?* Deepened snow did not enhance plant nutrient uptake, but the combination of deepened snow and more litter around taller shrub plants enhanced nutrient uptake.

Q5. What are the impacts of herbivory on vegetation production and composition, and how might these impacts be altered as a result of climate change? The influence of caribou herbivory on vegetation composition and chemistry, under both ambient and elevated soil fertility, were assessed through point-framing and a destructive harvest. Preliminary results indicate that increased soil nutrient levels significantly altered vegetation diversity in the presence of herbivory, but not in the absence of caribou.

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Catlin Arctic Survey

On March 1, 2009, the Catlin Arctic Survey undertook a 73 day trek across the floating sea ice of the Arctic Ocean. The team of explorers covered a distance of 435 kilometres, heading northwards from 81.83ºN 129.97ºW to 85.45ºN 124.84ºW, which was reached on May 7, 2009.

The intention of the survey was to capture data on the thickness of the floating sea ice. Hadow developed, along with other scientists, a pioneering method of conducting sea ice surveys. This included manual drilling at regular intervals along the route and observations of morphological features, such as pressure ridges, rubble fields and open leads of water. Six thousand separate pieces of data were generated and have been analysed by the Polar Ocean Physics Group, University of Cambridge.

Catlin Arctic Survey's core scientific objective is 'to help scientists determine, with a higher degree of certainty, the likely timeframe for seasonal sea ice loss'. The data gathered in 2009 supports the new consensus amongst sea ice researchers, which, based on seasonal variability in ice extent and thickness, changes in temperatures and winds, and ice composition, states that the Arctic will be ice-free in summer within about 20 years, with much of the decrease happening within 10 years.

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Licence No: 14542
Location: in offshore and nearshore areas of the Beaufort Sea, and at several coastal locations

Ajurak 2009 field data collection program
The Ajurak 2009 Data Collection Program consisted of biophysical sampling from the CCGS Nahidik, aerial surveys for marine mammals and polar bears, and a subsistence fishery survey in Tuktoyaktuk.

Sampling was conducted from the CCGS Nahidik from July 20 to August 6 and from September 12 to 20. The sampling stations were located in the Tuktoyaktuk Harbour and entrance, the Mackenzie River plume front, Wise Bay, Summers Harbour, and McKinley Bay. Biophysical sampling included measuring temperature and salinity, and collecting zooplankton, benthos, and fish. Samples were also collected for contaminant analyses in water, sediments, and fish. In McKinley Bay, only sediment samples for contaminant analyses were collected. Temporary tide gauges and oceanographic moorings were deployed and recovered in Tuktoyaktuk Harbour, Summers Harbour, and Wise Bay. Two oceanographic moorings were also placed along the plume edge in late July and recovered in late September. Transects measuring salinity, temperature, and currents along the plume edge were also conducted.

Marine mammal aerial surveys were conducted monthly between June and November over the Ajurak area and vicinity. Marine mammal and seabird observations were recorded. A survey of the Tuktoyaktuk subsistence fishery was conducted in September.

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Location: Ulukhaktok, Inuvik, Norman Wells, Yellowknife

Canadian gravity standardization network modernization - northern surveys
Very high-precision measurements of the acceleration due to gravity at the Earth's surface are the focus of this survey activity. The "absolute gravimeter" (AG), the instrument used in this project, is capable of measuring the gravity at a point on the Earth's surface to a precision of one-part-per-billion. This work is being conducted as part of a larger national activity that provides the framework for an updated Canadian Gravity Standardization Network (CGSN), and will ensure that the NWT maintains a consistent gravity reference datum common with Canada. The 2009 AG field campaign focused primarily on Northern Canada, and included measurements at 4 gravity sites, which were located within the following municipalities of the NWT: Inuvik, Yellowknife, Ulukhaktok, and Norman Wells.

Observations from the CGSN modernization surveys will be archived on the publically-accessible Canadian Spatial Reference System (CSRS) database. No significant scientific publications have been produced using data collected during this "phase-one" survey. In terms of possible future work, the modernized CGSN has been designed to consider other relevant objectives, such as longer-term monitoring for factors driving height changes at individual stations. Nationally, the priority for repeated observations will be determined based upon the potential societal and scientific benefit.

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File No: 12 404 710 **Licence No:** 14499
Region: IN **Location:** Over sea-ice north of Sachs Harbour

Pan-Arctic climate, weather and sea ice measurements

The campaign PAM-ARCMIP (Pan-Arctic Measurements and Arctic Climate Model Inter-comparison Project), with the POLAR 5 research aircraft, was performed from March 31 to April 28, 2009. The aircraft was operated by the Canadian Aviation partner Enterprise Airline Inc. Scientists from six research institutes in Germany, Canada, USA and Italy were involved in the project, and carried out measurements in the Arctic over the four week period. The flight operations (105 flight hours) were performed under difficult arctic spring conditions. A traverse from the European Arctic (Longyearbyen, Svalbard) to the North American Arctic (Barrow, Alaska) was successfully completed. En route, overnight stops were made at Station Nord, Alert, NP-36, Eureka, Resolute Bay, Sachs Harbour, Inuvik, and Fairbanks. In addition, northward flights were performed over the Arctic Ocean from Longyearbyen, Alert, NP-36, Eureka, Sachs Harbour and Barrow. The research team arrived in Sachs Harbour on April 15 and left Inuvik on April 17, 2009. During this period, one research flight was performed, in order to measure ice thickness, trace gases, aerosols and meteorological parameters over a key region of the Arctic. The entire operation was exceptionally arranged and supported by the research partners, demonstrating the importance of close international collaboration.

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Region: DC **Location:** Enterprise, Hay River, Hay River Reserve

Hay River ice jam study

This 2009 field research program brought members of both the University of Alberta (UofA) and the Department of Indian Affairs and Northern Development (DIAND) to the Town of Hay River to observe, measure and document late-winter (March 8 to 13) and breakup (April 15 to May 8) ice conditions. Ground-penetrating radar and manual measurement techniques were used to assess ice thickness throughout the delta. During breakup, UofA/DIAND field crews worked with the Town Flood Watch

Committee to measure ice jams and document the river's breakup progression. In 2009, a significant amount of water and ice moved into both delta channels, resulting in an evacuation on Vale Island and in the old village of the Kátl`odeeche First Nation Reserve. Some minor flooding occurred.

UofA enhanced their web site for the public to keep residents apprised of breakup conditions as they developed. Town officials also provided resources and logistical support to enable remote connections to the Alexandra Falls, Paradise Gardens, and Pine Point Bridge monitoring sites, so that images from cameras there could be posted on the web.

Work on the development of ice jam flood forecasting models continued using new data collected in 2008 and 2009.

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Region: GW, DC, SS
Location: Inuvik, Tsiigehtchic, Fort Simpson, Fort Smith

Geological carbon in the Mackenzie River Basin: Sources and sinks of atmospheric carbon dioxide

During July 2009, samples were collected from throughout the Mackenzie River Basin. Suspended sediment and water samples were collected from depth profiles within river channels, using a custom-built, clean, depth sampler. An Acoustic Doppler Current Profiler was also used in order to measure the velocity of the water, allowing the amount of water and sediment transported to be calculated. There are some preliminary results from the suspended sediments. First, the amount of organic carbon carried in the river varies with water depth. Near the river bed, water-logged organic matter is transported. This shows how important it is to sample river sediment throughout the channel cross section . Radiocarbon was used to date the organic carbon carried by the rivers, and initial results show that it is very old (~10,000 years). It is proposed that this is because of erosion of ancient organic carbon from bedrock in the mountains, but may also be due to old organic carbon from permafrost. Further analysis is awaited, in order to investigate these interesting results in more detail.

The research team gratefully acknowledges logistical advice and equipment support from the Aurora Research Institute, Environment Canada, and the local communities, with whom they discussed the project before fieldwork.

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Location: Inuvik, Tsiigehtchic

Arctic great rivers observatory

This project studies the 6 largest rivers that flow into the Arctic Ocean. In North America these are the Mackenzie and Yukon, and in Russia, the Ob', Yenisey, Lena, and Kolyma. The concentration of naturally occurring chemicals, such as carbon, nitrogen and phosphorus, is being measured in these rivers in order to obtain baseline information about the flow of these chemicals to the ocean, and to help explain how climate change is impacting arctic rivers.

This is a three-year project, and 2009 marks the end of the first year. Most of the samples have been collected, but laboratory analyses are still underway. All data from this project will be posted on a public website (http://www.aoncadis.org/). Preliminary data should be posted before the end of 2009.

Two sampling trips were taken to the Mackenzie River in 2009. During the first (late May and June), we took daily one litre samples of riverwater from the shore near Inuvik, and also took three samples by boat near the Tsiigehtchic ferry crossing. For the second (September 8), we took one sample by boat near Tsiigehtchic. All boat samples were less than 15 litres of water. We expect our next sampling trip to occur in the late-winter/early-spring of 2010.

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Location: Inuvik, Aklavik, Tuktoyaktuk

Environmental Studies Across Tree Line

Fieldwork was conducted for the Environmental Studies Across Treeline (ESAT) project in March, July and August 2009, and was assisted by the Inuvik Hunters and Trappers Committee and Inuvialuit and Gwich'in youth. ESAT scientists hosted a workshop to provide training for 9 community environmental monitors in Inuvik in March in conjunction with the Inuvialuit Joint Secretariat.

The ESAT project focussed on five areas of study:

1) Monitoring of permafrost conditions, including ground temperatures and ground ice, in the Mackenzie Delta region. This monitoring has been ongoing since 2004. Near-surface drilling to determine terrain sensitivity was expanded, in particular along the Dempster Highway and at Tsiigehtchic.

2) Freeze-back of the active layer of various terrain types was examined as a first step in determining their sensitivity to overland winter travel. The active layer of dry, hummocky upland tundra froze over 1 month before the saturated, polygonal terrain of the outer delta, indicating that polygonal terrain may be more sensitive to overland travel in early winter.

3) To examine the influence of shrub removal on frozen ground and snow conditions at abandoned drilling-mud sumps, thermistors were installed in two sump caps in the outer Mackenzie Delta. Baseline ground temperatures will be collected in 2009, and shrub vegetation will be removed from one of the sumps next summer.

4) To investigate the effectiveness of different soil sampling protocols on describing contaminants in permafrost soils, soil samples were collected around 6 sumps in the Mackenzie Delta region. Analysis of last year's results from 3 sumps indicated that contaminants move preferentially through trough features, and that soil sampling protocols should account for patterned ground features.

5) Monitoring water quality of tundra lakes was continued. This monitoring has been ongoing since 2006. Water chemistry results will be compared with previous data to detect changes over time.

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Tundra-atmosphere carbon exchange
No research was conducted under this licence.

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Region: IN **Location:** Ulukhaktok, Sachs Harbour

Chemical evolution of a hypersaline high arctic coastal lake
From 24 May to 28 June 2009, a field camp was established at Shellabear Lake. The camp consisted of two sleeping tents and one cook tent, located approximately 2 km from the lake. During the first week, a snowmobile was used for transportation. In June, all work was done by foot. All equipment and infrastructure was removed in late-June by helicopter. Previously, in 2006 and 2008, short-lived expeditions were carried out from a camp at Cape Bounty, Melville Island, Nunavut (100 km east).

In lateMay, long sediment cores were collected from the bottom of the lake. The cores were sealed and returned to the laboratory for analysis. These cores will be investigated for linkages to past climatic conditions. For the following four weeks, an intensive sampling program looking at the physical and chemical characteristics of Shellabear Lake was performed. Water samples were taken from the lake at different depths and studied for isotopic and ionic concentrations. In addition, a small instrument that was left underneath the ice in 2008 was recovered from the lake.

Results from the field campaigns of 2008 and 2009 illustrate an interesting narrative for Shellabear Lake. The lake is currently reconnecting to the ocean, as the land in the area subsides. The data from the moored instrument reveals that there is a distinct tidal signal, during the summer months. In the winter, the lake is cut-off from the ocean, due to snow and ice in the outlet. The lake is also about 1.5 times saltier than the ocean. Ice growth modeling suggests that this excess salt is likely due to freezing processes in lake ice that reject brine into the lake water. Understanding the processes that are occurring in Shellabear Lake will provide insight into the formation of other hypersaline lakes in the high arctic.

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Thaw flows and ground ice investigation in sediments in Fort McPherson region, NWT

In August 2009, two thaw flows near Fort McPherson were visited by the research team, located at 1) 67° 15' 11" N, 135° 16' 17" W and 2) 67° 15' 18" N, 135° 13' 59" W. The second thaw flow is one of the largest thaw slumps recorded in the Peel Plateau and Richardson Mountain area. The research team spent 10 days collecting sediment and ice in the headwalls of these two study sites. A field assistant helped to collect the ice and sediment samples. During this period, we stayed at the campground near the Peel River at Fort McPherson.

The collected material will be used and analysed by two students, one Masters student and one Doctorate student.

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2008-2010 baseline studies for Avalon Ventures Ltd. proposed Thor Lake rare earth metals project - soils, terrain and permafrost component

No research was conducted under this license.

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2009 baseline studies for Avalon Ventures Ltd. proposed Thor Lake rare earth metals project – groundwater hydrology and hydrogeology

The objective of this field program was to describe hydrogeologic and hydrostratigraphic units, measure the occurrence of groundwater, quantify hydraulic properties of the units, and sample, analyze and summarize the groundwater chemistry at the Thor Lake site.

Field work during 2009 included drilling, logging, hydraulic testing, and installing two deep groundwater monitoring wells (MW09-151 and MW09-152) up to 99.7 meters below the ground surface in the project area south of Thor Lake. The monitoring wells, including those installed in 2008 (MW08-123, MW08-124, MW08-127, MW08-128, MW08-130, MW09-151, and MW09-152), were monitored for depth-to-groundwater and sampled for select analytical parameters in June and October 2009. The borehole logs, hydraulic test results, groundwater elevations, and groundwater quality results were tabulated.

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2009 baseline studies for Avalon Ventures Ltd. proposed Thor Lake rare earth metals project - surface water hydrology

The objective of this field program was to characterize the surface water hydrology and climate at the Thor Lake site.

Field work, during 2009, included water level monitoring in the following lakes at the project site: Thor Lake, Long Lake, Cressy Lake, and Elbow Lake. Water levels were recorded using a Hobo pressure transducer and water level gauge. Stream flow monitoring was completed at the outlets of Thor Lake, Long Lake, Fred Lake, and Murky Lake. Stream flow measurements were taken following standardized field sampling methods. The drainage patterns from Thor Lake and Elbow Lake to Great Slave Lake were evaluated based on field reconnaissance and mapping. Stream flow connectivity between Ring, Buck and Drizzle Lakes was assessed based on field reconnaissance.

Climate monitoring continued at the site using a Watchman 500 weather station. Data were periodically downloaded, and station maintenance was also completed in 2009. A snow survey was completed in late March 2009 to coincide with Environment Canada surveys in the region. Field methods followed British Columbia Ministry of Environment guidelines. Six snow courses were sampled at the project site.

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Biogeochemistry of lakes in the Mackenzie Delta

During May 2009, two researchers and an Aurora Research Institute summer student took water samples from five Mackenzie Delta sites in order to measure nutrient and carbon concentrations during spring break-up and flood. While ice cover was still intact, samples were taken through auger holes. Once ice cover began to break up, samples were taken in stretches of open water from a helicopter on floats.

Water samples were taken back to the Inuvik Research Centre, where they were filtered and partitioned for a variety of nutrient and carbon measurements. Ammonium, phosphorus, and chlorophyll were measured at the research centre, during May 2009, while some other samples (e.g., particulate nutrients, total dissolved nitrogen) were sent to a government lab for analysis. The remainder of the samples were brought back to Simon Fraser University, where carbon and major ion concentrations were measured. As of January 2010, most analyses are complete, and the research team is now in the process of checking and summarizing the data. Although the results are preliminary, they indicate that, during the break-up and flood, measured levels of sediment and carbon in Delta channels are far higher than those predicted using sediment and carbon data collected only during prior open-water summer seasons.

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Region: SA
Location: Délı̨nę, Fort Good Hope, Norman Wells, Tulıt'a

Geological fieldwork in Mackenzie Plain and adjacent mountains

Four scientists, two from the Geological Survey of Canada (Calgary) and two from the Northwest Territories Geoscience Office (Yellowknife), did field work based out of Norman Wells for 4 weeks, in the summer of 2009. They were accompanied by two geology students from the University of Calgary and Dalhousie University. Helicopter services, accommodation, and food services were provided by local businesses in Norman Wells.

Field work involved landing by helicopter at 255 rock outcrop sites on ridges and stream exposures from the eastern Mackenzie Mountains to the Franklin Mountains. Locations and rock descriptions were recorded, and measurements of thickness and orientation were taken. 185 rock samples were collected, varying in size from a fist to slightly larger than a loaf of bread. These samples have been shipped to labs at the Geological Survey of Canada in Calgary, where they are currently undergoing both paleontological analysis(to determine the ages of rock strata) and organic chemistry techniques(to assess the potential for the presence of oil and gas in various layers). These data are being used to produce updated maps of bedrock geology for the areas around Norman Wells and Tulita (NTS map areas 96C, 96D, 96E, and 96F).

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Environmental surveys of Fortune Minerals NICO project

The 2009 environmental studies at the NICO Property were intended to supplement data collected during previous years, and included an assessment of fish, fish tissue and fish habitat; water quality; wildlife presence and abundance; vegetation; and the geochemistry of the project area. Environmental surveys were conducted within a 5 km radius of the mine site(the local study area) and within a 5 km buffer of the proposed road route.

The 2009 fisheries program at the Fortune NICO site was also designed to supplement existing information and address known data gaps. This program focused on determining the presence and relative abundance of small-bodied fish species; fish tissue collection from large-bodied and small-bodied fishes; habitat mapping; and verification of previous data. Fish sampling was completed in Nico, Peanut, Burke, Lou, and Reference lakes, as well as ponds 9 and 13. Detailed habitat maps were completed for the inflows and outflows of all major lakes that were not mapped in previous years. This included the inflow of Burke Lake and the outflow of Reference Lake, Burke, Nico-Peanut Creek and Peanut. Additionally, the above-mentioned streams and lakes in the NICO Project area were surveyed for the presence of fish spawning habitat, rearing habitat and water quality, as well as the presence/absence of fish migration barriers and overwintering habitat, if applicable.

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Hydrological studies, Mackenzie Delta region

This project yielded a number of results, during 2009. First, field observations showed that streamflow can be accurately predicted using a number of hydrologic models. This allows for consideration of the impacts of changing climate and resource development on the hydrology of this region. Published reports have used these hydrologic models to show that there has been little change in upland lake levels over the last 32 years. Another report showed that climate change over the coming decades is likely to result in large changes in streamflow, with spring runoff occurring earlier, increased runoff over the summer, and an increase in the occurrence of mid-winter melts.

Second, mapping and dating of upland lake drainage showed that 41 lakes drained between 1950 and 2000, and the number of lakes draining per year has decreased over this time.

Third, research observations in the Mackenzie Delta have demonstrated the frequency of flooding in the outer delta and shown the importance of ice conditions at the outlet of the delta to the Beaufort Sea in controlling water levels. This is improving our ability to predict water levels in the delta. Another study showed that, for low elevation delta lakes, the number of days they are connected to the main channels has increased, but that for higher elevation delta lakes the number of days they are connected to the main channels has decreased. Ongoing research is considering the reasons for these changes.

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Location: Cape Grassy on Melville Island and South of Enterprise along the Hay River

Jurassic and Cretaceous ichthyosaurs diversity in northern Canada

This paleontological research was planned for the following two regions of the NWT: Melville Island and the region south of Enterprise. Research on Melville Island was not undertaken, due to a failure to secure sufficient funding . The area south of Enterprise was investigated in late-August and early-September, however, fossil collection could not take place due to high water levels in the Hay River. Collection could not take place in 2008, for the same reason. Apparently, the bedrock in this region is only exposed during periods of severe drought. For this reason, permit renewal will not be sought in 2010.

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Location: Ulukhaktok

Minto Inlier, NWT aeromagnetic survey

The objective of this research was to acquire high-resolution aeromagnetic data in an area centred on Minto Inlet, including the community of Ulukhaktok. Aeromagnetic surveys measure the magnetic properties of bedrock, and are one of the tools used in geological mapping. Understanding this magnetic data will help geologists map the area, assist mineral exploration activities, and provide useful information necessary for communities, aboriginal associations, and governments to make land use decisions.

The survey collected approximately 79,000 km of data flown along parallel lines spaced 400 m apart. The flying height was at a nominal terrain clearance of 150 m. The intensity of the total magnetic field was measured from the aircraft.

The survey was to be flown between 15 July and 15 October 2009, however, poor flying conditions led the survey to be halted and continued in Spring 2010. Acquisition was completed on May 28 2010. Final data have been accepted for the survey and preparation of maps for publication is underway. Publication of the data and maps is expected on or about 15 September 2010.

The data acquired over the Minto Inlier area are of high quality and will serve their intended purpose.

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Region: IN, SA **Location:** Inuvik, Tuktoyaktuk, Norman Wells

Northern phase 1 environmental assessment program - remote sensing pilot project
The purpose of this project was to determine, through the use of remote sensing technology, the environmental status of former exploration sites, and to determine if the remote sensing technology could provide adequate, cost effective information for environmental site assessment.

Three aerial mobilizations were necessary to acquire the imagery, due to interfering weather conditions. These mobilizations occurred on 18-23 July, 6-11 August and 19-24 August 2009. The third and final mobilization attempt resulted in a successful capture of imagery. Remote sensing data was not collected at 36 sites originally identified for imagery collection in 2009. Twelve Sahtu sites could not be collected because of weather interference on the day of data collection. Twenty-four offshore sites were removed from the pilot program because it was determined that aerial remote sensing technology is not effective for sensing objects through a water column.

Seventy-seven remote arctic sites were assessed in less than 3 days. The work was completed without any safety incidents. All stakeholder expectations, as identified through consultation meetings and the Scientific Research License requirements, were met. The technical requirements of the program, as outlined in the scope of work at the initiation of the program, were all met or exceeded. The remote sensing data set that was collected includes orthophoto data, thermal infrared data (for ground temperatures), hyperspectral data (for visible, ultraviolet and infrared wavelengths of light), and LIDAR (for elevation of the land). The review and analysis of the information is ongoing and is expected to result in conclusions by the end of 2010.

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File No: 12 404 712 **Licence No:** 14509
Region: NS **Location:** Yellowknife

Sunphotometer measurements at Yellowknife
Measurements of aerosol optical depth, which indicates the vertical concentration of aerosols and their size, were acquired at the Yellowknife station of the AEROCAN sunphotometry network from April to November of 2009. There were some interesting indications of events involving sub-micron aerosol particles less than 1 / 1000 of a millimeter in radius, which were most likely associated with smoke

incursions. There were also events involving super-micron aerosol particles greater than 1 / 1000 of a millimeter in radius, which were probably thin homogeneous cloud or possibly dust, and very possibly Asian dust, during the latter part of April and early May. We have not had time to analyze this data in detail.

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Region: IN, GW **Location:** Aklavik, Inuvik, Tuktoyaktuk, Tsiigehtchic

Examining the impacts of climate change on aquatic and terrestrial ecosystems of the Mackenzie region, NWT

The objective of this research is to document the impacts of permafrost slumping and failed drilling waste sumps on small lake ecosystems. In 2009, the research team collected sediment from the bottom of a number of small lakes located between Noell Lake and Swimming Point. We visited 30 lakes, where we collected water and lake sediment. We also deployed passive water samplers in 22 lakes, to determine if thaw slumps are releasing contaminants into the lakes. Sediment cores are currently being dated using 210-Pb. Algae (diatoms) preserved in the sediment are being examined to determine how biological communities are impacted by slumping. Water collected from the lakes is currently being analyzed at both the Canadian Centre for Inland Water's National Laboratory for Environmental Testing and the Taiga Environmental Lab in Yellowknife. Preliminary analyses indicate that the diatom communities are sensitive to changes in lake water chemistry that result from the initiation of thaw slumps along the shoreline. Water chemistry analyses indicate that dissolved organic carbon, total phosphorus, soluble reactive phosphorus, and total mercury are lower in lakes affected by retrogressive thaw slumping than unaffected lakes. This could be due to deeper water infiltration through clay-rich tundra soils.

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Land management problems in hydrocarbon development areas with ice-rich permafrost: detection and assessment

Fieldwork activities related to the correlation between geophysical data and subsurface physical properties from borehole data were conducted at Parsons Lake, NWT, the site of a natural gas field located approximately 75 kilometres northeast of Inuvik. In order to correlate geophysical data with borehole data, capacitively-coupled resistivity (CCR) surveys were conducted along two primary transects at Parsons Lake in July 2009 and March 2010. Each transect intersected two boreholes. Electrical resistivity values from March 2010 were correlated with gravimetric ice contents for all four borehole locations. At boreholes C1 and C2, electrical resistivity increases logarithmically with ice content. At borehole P11, however, electrical resistivity increases linearly with gravimetric ice content. For sites C1, C2, and P11, it is clear that gravimetric ice content controls electrical resistivity at site-specific rates. The R^2 values range are 0.46, 0.56, and 0.62 for C2, C1, and P11, respectively. All correlations are significant at a 95% confidence level. Hence, there are additional environmental factors that need to be considered to improve the regression model, such as unfrozen water content, ice structure, and geochemical variables like salinity.

Although three out of the four borehole sites reveal encouraging correlations between electrical resistivity and gravimetric ice content, the relationships are seasonally dependent. For C1 and C2, the peaks of electrical resistivity in the subsurface occur at roughly the same depth as gravimetric ice content. In summer, the peaks of electrical resistivity occur at a lower depth. Hence, additional unfrozen water content in summer could be responsible for the displacement of the resistivity function's peak at both sites. In the future, we plan to quantify ice structure with ground-penetrating radar (GPR) and develop unfrozen water content proxies with borehole data.

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Region: DC **Location:** Fort Simpson, Jean Marie River

Landscape change resulting from permafrost melt in the lower Liard River valley: implications for stream flow in the region

The permafrost cover within the Scotty Creek research basin has decreased from 72% in 1947 to 40%, in 2008. Aerial image analysis of Scotty Creek also indicates that the density of linear disturbances (e.g. winter roads and seismic cutlines) is more than 6 times greater than the natural drainage density. Where linear disturbances traverse permafrost, the black spruce trees were removed and the underlying permafrost has since thawed, resulting in a grid of permafrost-free channels that cut across wetlands and allow them to drain to streams. These changes to the landscape from climate warming and human disturbance introduce considerable uncertainty to the future availability of northern water resources.

This project is providing an improved science-based understanding of water flow and storage processes in northern ecosystems, new tools to predict water flow and storage processes, and new mitigation and adaptation strategies, so that federal and territorial agencies can more confidently develop guidelines and codes of practise for water resources, in the context of thawing permafrost and landscape change. In addition to publication and presentation of results, this project is also providing the GNWT (ENR) and INAC with timely and critical scientific input for the development of policy documents related to water resources and climate change.

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Region: IN **Location:** Ulukhaktok

Geology and resource potential of northwest Victoria Island
Researchers from the Geological Survey of Canada, University of Sasakatchewan and NWT Geosciences conducted a preliminary reconnaissance geological survey of the Precambrian and lower Paleozoic rocks in the Minto Inlet area of western Victoria Island between 30 June and 13 July 2009. This work allowed for the planning of a more substantial survey, which will be conducted between mid-June and early-August of 2010. This preliminary study was done by helicopter, based out of Ulukhaktok, and allowed for the assessment of a potential camp site for the 2010 base of operations. Three wildlife monitors from the community were employed over the course of this work. An environmental site assessment of the chosen site was completed in early-August 2009 and fuel for our 2010 operations was brought in by barge and stored at a temporary site on the outskirts of the hamlet.

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Region: SA **Location:** Délı̨nę

Modelling temperature and heat fluxes of Great Bear Lake
Research on Great Bear Lake has proceeded on schedule. In July 2009, personnel from the National Water Research Institute (NWRI) and the Institute of Ocean Sciences were flown to Deline for data and instrument retrieval. Retrieval of meteorological instrumentation from Lionel Island and from Deline (old airport runway) proceeded well with help from the community. However, retrieval of the three fixed temperature moorings and three APEX profilers from the lake was severely hampered by the unavailability of the DRRC vessel, the Debra Lynn. A float plane from Northwest Airlines was commissioned to attempt the retrievals, however, only one fixed temperature mooring, located at the mouth of the Keith Arm, was retrieved. An attempt was made to retrieve the KOEYE temperature mooring at the McTavish Arm (446m deep), however, this was unsuccessful. This investigation was the first to deploy the APEX profiler in a large deep lake. The instrumentation successfully recorded and transmitted temperature profiles at 3 day intervals. The APEX profilers have a nominal battery life of 5 years and we expect them to be operational for at least two more years, if they survive winter ice conditions.

All of the meteorological data from Deline (old airport runway) and Lionel Island, and all of the lake data retrieved from fixed temperature moorings, including currents and water transparency, have been processed for 2008 and 2009. Preliminary work to analyse these data in terms of the magnitude and variability of the measured variables has begun. In addition, we have collated hydrological data from the primary inflow and outflow locations in the lake, as well as water levels archived by the Water Survey of Canada. The lake temperature data from fixed moorings and APEX profilers has been augmented by analysis of satellite digital data of the surface temperature.

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Region: DC
Location: Fort Simpson

Stratigraphic and paleontological reconnaissance of Devonian geology, Hay River area, NWT
In September 2009, a joint Alberta Geological Survey, University of Alberta, and Illinois State University geology team explored the rocks around Hay River and along the Mackenzie Highway, south of Great Slave Lake. From the work in the Northwest Territories and later work in the lab, the team:

1. Discovered that the rock formations in the southern Northwest Territories could not be easily traced to equivalent rock formations in northeastern Alberta around Fort McMurray, and therefore, more research is needed;
2. Described and reconstructed the Alexandra Reef, which appears in a limestone rock outcrop at Alexandra Falls and in rock outcrops along the Mackenzie Highway; and
3. Discovered that fossil ecosystems, which lived in an ancient ocean that covered the southern Northwest Territories, approximately 385 million years ago, experienced complex interactions between the animals that inhabited the ocean floor. These ecosystems were most similar to fossil ecosystems in Iowa, USA, both in terms of predator-prey relationships and in terms of organisms which encrust other organisms (like barnacles encrusting scallop shells). This paper can be read online at http://www.geocanada2010.ca/uploads/abstracts_new/874_SchneiderAbstract.doc.

Currently, the team members, including one graduate and two undergraduate researchers, are continuing to research the data collected from the rocks of the Northwest Territories.

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Region: IN, GW, SA, DC
Location: Inuvik, Tuktoyaktuk, Fort McPherson, Tsiigehtchic, Délı̨nę, Fort Good Hope, Norman Wells, Tulıt'a, Fort Simpson, Wrigley

Permafrost monitoring and collection of baseline terrain information in the Mackenzie Valley corridor, NWT
Permafrost monitoring sites in the Mackenzie corridor (in the Inuvialuit, Gwich'in, Sahtu, and DehCho regions) were visited in 2009, to acquire ground temperature and active layer data. This included data acquisition from 40 new monitoring sites, established in 2007 and 2008. At least one complete year of ground temperature data are available for these sites. New permafrost temperature information is available for areas in which little recent information existed, providing an updated description of permafrost conditions throughout the corridor. We have improved our characterization of the range in permafrost temperatures for typical terrain conditions and have determined that permafrost temperature in the discontinuous zone falls in a narrow range and is generally warmer than -2°C.

Extension of records for long-term sites has enabled an improved characterization of recent trends in permafrost conditions. Permafrost generally warmed over the last two decades, but initial analysis of recent data indicates that the warming rate may have decreased, which is consistent with the cooler air temperatures that followed the extreme 1998 warming. Long-term site maintenance and continued data collection is planned to better characterize the impact of climate change on permafrost environments, and to provide essential baseline information to aid land use planning decisions.

A more detailed report on activities and graphical data presentations is in preparation, and will be sent to relevant organizations in the region.

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Region: SA, NS, SS
Location: Gamètì, Łútsę̀lk'é

Teleseismic studies in the Wopmay

During the summer of 2009, the following activities were carried out: i) two new seismic stations were installed at existing exploration camps (i.e., Sanatana's Sulky camp and Diamond North's Hepburn camp); ii) three existing stations were maintained for another year in the Gameti area; and iii) ten stations were maintained in the East Arm, Great Slave Lake region. All of these stations successfully recorded more than 100 distant earthquakes, during 2009. Analysis of records from the Gameti area suggests that rocks associated with the Slave region continue as far west as Gameti at 20-40 km depths, and probably much farther westward at greater depths. Analysis of data from the East Arm suggest that rocks from the Great Slave Lake region dip southward to perhaps 100 km depth. Both results are important clues about diamond potential in areas adjacent to the operating diamond mines of the central Slave region.

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Region: IN
Location: Tuktoyaktuk

Comparative studies of pingos and pingo clusters in the Tuktoyaktuk Peninsula, NWT and Athabasca Valley, AB

The aim of this 2009 field campaign was to revisit some of the sites visited in previous years, in order to expand the data base of site characteristics. Towards this end, the research team travelled by truck to the twin pingos west of the town dump in Tuktoyaktuk, NT, and by boat to the pingo and massive ice exposures at Peninsula Point, Tuktoyaktuk, NT. Also, a charter aircraft was hired out of Inuvik, NT, to take the team to two exposed pingos at Husky Lakes. Landforms that are suggestive of these pingos have been observed on Mars, as have landscapes that show some features consistent with the presence of massive ice. As we understand it, the processes associated with the origin and development of pingos and massive ice on Earth will help to develop meaningful hypotheses about the formation of similar features on Mars.

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PolarDARN (the northern hemisphere polar portion of the International SuperDARN (Super Dual Auroral Radar Network) program)
2008 was the first full year in which the PolarDARN radars at Rankin Inlet and Inuvik operated together (Rankin Inlet began in May 2006 and Inuvik in December 2007). Joint operations have continued through 2009, with both radars operating well. Of the 20 operating SuperDARN radars, the PolarDARN radars in 2008/09 were the best in the entire network.

The reason for this is that sunspot activity has not been this low since 1913. There is an 11-year sunspot cycle. Cycle 23 began in 1996 and should have finished by about 2007, with Cycle 24 starting up. However, during the years 2007, 2008 and 2009, only very few Cycle 24 sunspots have been seen. Most wereweak, with the strongest being sunspot 1029, during October 2009, which was seen for about 7 days. As a result, the regions where the northern lights (aurora borealis) normally occur has shifted to higher latitudes, to just the locations where the PolarDARN radars are looking. The rest of the SuperDARN radars have seen much reduced signals. Since there is now a danger that sunspot activity may stop altogether in about 2015, recent measurements of ionospheric voltage patterns by PolarDARN may provide some of the most important data for the study of the energy fed to the Earth by solar winds during 2008/09, and may prove to be vital for climate studies. Sunspot activity stopped altogether during the period 1450 – 1540 and again in 1645 – 1715, which led to such cold weather that the whole period was called "The Little Ice Age". In summary, the PolarDARN radars were built at the right time and placed in the right locations to provide critical data about both the solar wind energy coming to the Earth and the behavior of the climate during the next few decades.

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Region: IN **Location:** Inuvik, Aklavik, Sachs Harbour, Tuktoyaktuk

Geological conditions affecting industrial and community development in the coastal and nearshore regions of the western Canadian Arctic - year 3/3

During 2009, the research team continued to investigate the Mackenzie Delta and shallow nearshore regions throughout the year. During spring breakup in May-June 2009, the team documented the progress of breakup in both the delta and offshore, and distributed their observations to interested organizations and individuals in the 2009 Breakup Report. Currents caused by the drainage of water can overflow onto the sea ice, creating scours of the seabed. In 2009, seabed scouring reached up to 5.5 m deep in one location, with shallower scours 0.5-2 m deep in other places. Seabed mapping in the summer showed that some scours can infill in a single season. A series of very deep scour holes, up to 26 m deep, in the middle of Shallow Bay, were also mapped. It appears that these have remained open for many years. Additionally, currents and waves were measured and the seabed was mapped during the summer, in order to find out how the sediment delivered to the delta in the spring is redistributed during the open water season. The research team continues to measure subsidence (sinking) of the delta in areas that could be affected by oil and gas activity. Rates between 2 and 5 mm per year (relative to Inuvik) have been documented in the delta.

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Location: Yellowknife

Investigations of the hydrological processes of the subarctic Canadian Shield

The objective of this research to determine the hydrological processes, or water cycle processes, that influence the streamflow response of Baker Creek (Yellowknife, NT) and similar streams. A secondary objective is to understand how the hydrological processes acting over smaller areas influence those processes that are predominant over larger areas.

Field activities in the Baker Creek research catchment began with spring snow surveys and the activation of climate towers and water level stations in April. From mid April to mid July 2009, two University of Saskatchewan students lived at a field camp at Vital Lake (Yellowknife, NT), and took observations of the spring snowmelt and flooding. Until mid-July, the students measured water tables, soil moisture, meteorological variables and streamflow. SPOT satellite imagery was obtained for four dates during the 2009 open water season, following spring snowmelt. These images were used to measure how the extent of saturated surface areas changes during the spring and summer. The observed water budget and satellite data implies that much of the catchment dries, due to evaporative losses during the summer. This prevents water from most of the watershed from reaching the channel in all but the wettest situations.

The "connectivity" of the drainage basin modulates its ability to respond to precipitation events and is a function of the complex and variable storage capacities throughout the drainage basin and along the drainage network. Connectivity was measured as the fraction of active relative to maximum potential stream reaches. The impact of the type and location of elements, specifically lakes and wetlands, along the drainage network was deduced. The types of land cover and their relative location in the basin is of exceptional importance to how hydrologically connected a catchment is, and to the amount of runoff rainfall can produce.

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Region: IN **Location:** Sachs Harbour

Mio-Pliocene plant DNA barcoding

Plant fossils were collected from the Miocene Mary Sachs Gravel (Duck Hawk Bluff) and the Miocene Ballast Brook and Pliocene Beaufort Formations (Ballast Brook River), Banks Island, NWT, Canada. The specimens were transported to Southern Adventist University, Collegedale, Tennessee, USA, for DNA processing and analysis. A final report will be submitted to Aurora Research Institute detailing the processing and results.

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Region: NS **Location:** Yellowknife

Wind energy monitoring at Thor Lake 2009-2010

The objectives of this wind monitoring project are to quantify the wind energy potential and assess the economic feasibility of installing a wind turbine, as part of the Avalon Rare Metals Inc. development near Thor Lake. A mine is expected to be built in the next few years and will employ 100 people. There will be a mine, a mill, and a camp, and the operation is expected to demand 5 to 10 MW of electric power, which will likely come from diesel and possibly hydro and wind.

In September 2009, a 50m wind tower, equipped with anemometers, a wind vane, and temperature sensors, was installed near the Thor Lake site along the Hearn Channel. Data files from this study site were downloaded monthly for one year. Data management and reporting is maintained by the Aurora Research Institute staff, in conjunction with the project engineer. The results of this study are forthcoming.

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RADARSAT observations of river ice and flood patterns in the Mackenzie River delta

In 2009, the project team carried out fieldwork during winter (February and March) and spring breakup (May). During winter, ice cover measurements were taken at 24 sites, which were selected on the basis of their appearance in available RADARSAT images. The majority of sample sites were located on the Middle Channel, from Point Separation to just north of Oniak Island. Measurements were related to snow cover characteristics (e.g. depth, grain size, wetness) and ice cover properties (e.g. thickness, roughness, composition). Collected ice cores were taken to the Aurora Research Institute for detailed analysis, which focussed on vertical structure in terms of ice type (e.g. snow ice, frazil ice, black ice). Preliminary analysis of the ground reference data and radar images demonstrates good potential for the application of RADARSAT to the mapping of river ice types. The results also show that RADARSAT can detect the thickening of ice cover over the winter season. However, efforts to map ice cover thickness can be complicated by variability in ice cover structure. During spring breakup, aerial surveys were carried out to record river ice and flood patterns by means of photography, to allow for the validation of RADARSAT derived ice cover and flood condition products.

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Region: IN, GW **Location:** Inuvik

Mackenzie Valley landslides geotechnical investigations

In 2009, a team of researchers from the Geological Survey of Canada continued their research on landslides in permafrost in the Mackenzie Valley. The objective of this project was to better understand slope failure mechanisms and landslide movement behaviours. Several landslides north of Inuvik and around Travaillant Lake area, south of Inuvik, were surveyed with tape measures and a laser ranger to collect data about the movement rates of the landslides. Three scientific papers were published in 2009, as a result of this research project.

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Region: IN **Location:** Inuvik, Tuktoyaktuk

Hydro-ecological responses of arctic tundra lakes to climate change and landscape perturbation

The goal of this work is to understand and model the effects of projected climate change on the supply of nutrients to tundra lakes, and on the biological communities within the lakes, using permafrost degradation as an analogy for changes under a warming climate. Four field campaigns were completed during 2009. Before snowmelt in early May, water and biological sampling occurred at a pair of representative lakes (one with permafrost shoreline degradation and one with undisturbed shorelines).

During spring and early-summer, snowmelt and water flow to these lakes was monitored in order to determine chemical and physical water properties. Unfortunately, plans for detailed landsurface mapping from a specialized aircraft in July had to be cancelled due to poor weather conditions. During late-August, sampling for chemical and physical water properties at the two lakes took place again, along with collection of biological food-web samples for identification and quantification. In September, the two lakes were sampled a third time for chemical and physical water properties and food-web biological samples. Analyses completed so far indicate that the water chemistry impacts of permafrost degradation determine the limiting factors for phytoplankton growth in these lakes, and that these lakes exhibit bottom-up controls on food-web structure/productivity.

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Region: IN
Location: Aklavik, Inuvik, Tuktoyaktuk

Noell Lake ice study - 2nd amendment to "Hydro-ecological responses of arctic tundra lakes to climate change and landscape perturbation"

The objective of this research is to improve our knowledge of lake ice and its effect on food webs and productivity in small arctic lake systems, in order to better predict changes that could occur under projected climate change. Our original plan was to install an automated ice buoy and subsurface mooring system, for continuous monitoring of weather conditions, lake ice cover (e.g., formation, growth over winter, breakup in spring), light penetration into the lake (including through ice in winter), and water quality in Noell Lake. The system is now built and is currently being tested. Due to the longer than expected time to ready the buoy and mooring system, the buoy system was not deployed in Noell Lake before freeze-up this year. The revised plan is to deploy the buoy system during the summer of 2010, in order to monitor the lake ice and its effects on the food webs and productivity throughout the following winter

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Region: NS **Location:** Yellowknife

Housing and being homeless in Yellowknife

This project provides an overview of government-assisted housing in the NWT, as well as homelessness in Yellowknife. Its focus is on the policies, programs, laws and regulations, as well as the economic factors, that are relevant to these themes, in the present and historically.

The purpose of this study was to: assess affordable housing problems and homelessness in the NWT; to publicize these; and to develop practical recommendations that will address problems related to housing affordability and homelessness. This research has a minor comparative dimension, contrasting government-assisted housing and homelessness policies and programs in the NWT with those of other Canadian jurisdictions.

Interviews (telephone, when appropriate, and in-person) were conducted with housing providers, community workers, public servants and other experts to develop a preliminary understanding of the main factors affecting affordable housing in the NWT, and homelessness in Yellowknife. All interviews were confidential, semi-structured and generally lasted between 30 and 90 minutes. They were recorded by the researcher with pen and paper.

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File No: 12 410 843 **Licence No:** 14516

Region: IN, GW, SA, DC, NS, SS **Location:** Aklavik, Inuvik, Tuktoyaktuk, Paulatuk, Fort McPherson, Délı̨nę, Norman Wells, Tulít'a, Fort Liard, Fort Providence, Fort Simpson, Gamètì, Behchokò, Whatì, Enterprise, Fort Smith, Hay River

NWT local government administrator leadership capacity

This research began with the following question: What strategies can the Government of the Northwest Territories (GNWT) undertake, in partnership with community governments and their representative associations, which would most effectively support the development of Northwest Territories' local government administrators' leadership competencies and capacities?

The research included a review of relevant/current academic literature on issues around local government administration (3 main themes: local government; human resource development; capacity building), data collection through two focus groups (one for elected leaders and one for administrators), and a case study of the Hamlet of Fort Providence, which included a document review and interviews with current and former elected leaders and administrators. An 'appreciative inquiry' approach was taken in looking at Fort Providence specifically – i.e., the Hamlet has successfully identified, trained and retained competent indigenous LGAs – what has made them successful?

The conclusions were grouped in a systemic framework, starting with the local government administrator (LGA), working out to the elected leaders/Council, then looking at the interconnection within the local government itself and finally looking at the community overall. The following recommendations were developed:

1. Encourage ongoing administrator development
2. Promote the development of capable indigenous administrators
3. Affirm the respective roles and responsibilities of elected leaders and administrators
4. Emphasize the importance and benefits of planning to local governments
5. Build elected leaders' understanding of the importance of LGANT
6. Partnerships should be established between local and aboriginal governments on capacity building

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File No: 12 410 839 **Licence No:** 14483
Region: NS, SS **Location:** Yellowknife, Hay River

Mobility, identity and the new economy: a multi-site ethnography
No research was conducted under this licence.

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File No: 12 410 846 **Licence No:** 14549
Region: IN **Location:** Inuvik, Tuktoyaktuk

A case study of Husky Lakes beluga co-management using network analysis
This project was chosen with the help of the Tuktoyaktuk Hunters and Trappers Committee (HTC) and the Fisheries Joint Management Committee (FJMC); it looked at the communication between the Inuvialuit and the Canadian government, with regards to the management of beluga whale entrapment in the Husky Lakes. A scientific method of studying the way that groups of people are organized, called network analysis, was used to see how the flow of communication has changed throughout the years. Interviews with all the members of the Tuktoyaktuk HTC, as well as the FJMC, and members of the Department of Fisheries and Oceans added to the project. The results showed that in the time from the

1960s to the present, the Inuvialuit have had increasing involvement and power in the decision making process relating to the management of whale entrapments. The whale entrapment issue highlights the importance of the co-management boards that were created under the Inuvialuit Final Agreement; this project shows that the boards have helped the Inuvialuit to increase their adaptability in a socially, environmentally, and economically changing Arctic.

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Healthy living in schools and substance sbuse among youth (part 2)

The two primary objectives of this pan Canadian project are: i) to describe young students' (11-18 years old) consumption of alcohol and other drugs in Canadian Inuit territories and ii) to gather teenagers', parents', elders' and leaders' perspectives on the reasons and impacts of substance abuse in Inuit territories. Another objective is to provide a description of their opinion on existing services and on solutions to address substance abuse problems in Inuit communities.

Applying the adolescent substance abuse screening instrument DEP-ADO and realizing qualitative interviews, data collection took place in the Nunatsiavut and Inuvialuit regions from April 2009 to June 2009. In the Nunavut region, data gathering started in November 2009 and was completed in March 2010. A total of 619 DEP-ADO questionnaires were completed and 52 interviews were realized, in 6 Inuit communities (two per region).

The analysis of the data for the Nunatsiavut and Inuvialuit regions started in October 2009. The analysis of the data from Nunavut started in May 2010. An Inuit analysis committee will be held in early December 2010 to help us interpret the results. The final results will be communicated in spring 2011.

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An examination of the NWT integrated emergency management model

Organizational effectiveness of emergency management systems in remote, isolated jurisdictions was considered through an examination of the specifics of risk. The study sought to identify relevant factors, which lead to effective emergency management systems, and considered whether these factors have application in other jurisdictions. The underlying research question was whether integration and decentralization lead to organizational effectiveness. The study aims to draw generalized conclusions on organizational effectiveness from: the findings of the literature review; an analysis of official documents; and the results of interviews conducted with emergency management officials from specific disciplines. This analysis extends beyond typical emergency management structures and includes an examination of other business models, that have been perceived as being effective under similar conditions.

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Homeless in a homeland: housing insecurity and resource development in the Northwest Territories
The main objective of this PhD research project is to understand the relationship between housing security/insecurity and homelessness in northern communities.

Fieldwork was conducted from February to May 2009, to follow-up on the initial fieldwork stage in 2008. In Inuvik, 10 in-depth interviews were completed; significant collaboration was achieved with various member organizations of the Inuvik Interagency Committee, which includes the Inuvik Homeless Shelter. A presentation was made to Inuvik Interagency Committee members on preliminary findings of the research.

In Yellowknife, 20 in-depth interviews were completed; significant collaboration was achieved with various member organizations of the Yellowknife Homelessness Coalition. A presentation was made to the Coalition on preliminary findings of the research.

Key factors for housing security expressed by research participants included: self- knowledge, cultural connections, home ownership, education and employment, personal safety, healthy relationships, and strong social networks. Key factors for housing insecurity included: trauma, violence, poor housing quality, inaffordability, dependency, government housing policies, housing shortage, and addictions. Links between housing insecurity factors and pathways to homelessness were explored with participants.

Community feedback workshops were held in Inuvik and Yellowknife in March 2010, to report back on preliminary findings and solicit feedback from organizations working with the homeless in both communities.

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Region: IN **Location:** Inuvik, Aklavik, Tuktoyaktuk

Community engagement in marine protected area (MPA) planning in the arctic: towards an arctic network of MPAs
No research was conducted under this licence.

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File No: 12 410 704 **Licence No:** 14605
Region: NS **Location:** Behchokò, Yellowknife

Exploring sub-surface land rights and the Tli'Cho land claim negotiations
No research was conducted under this licence.

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File No: 12 410 495 **Licence No:** 14469
Region: SA **Location:** Délı̨nę

Preparing for Délınę self government: mapping the enabling/disabling environment
During 2009-2010 research under this license consisted of assessments of institutional factors that will assist in implementing self-government and factors that may impede self-government implementation. Given the various demands made on community members, this research for the year consisted mainly in reviewing current institutional structures, to determine program and funding approaches and needs, to determine what type of models enabled capacity development and which undermined capacity development. The results will be incorporated into options for self-government implementation.

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Region: IN, DC, NS, SS **Location:** Tuktoyaktuk, Fort Providencs, Yellowknife, Fort Smith

Indigenous protocol
This project looks into how the development of a method of protocol, or a way of behaving when entering an indigenous community, will help relationships between indigenous peoples and visiting professionals who offer their services. Research for the project took direction from chosen indigenous elders from five indigenous communities in the Northwest Territories. Information was gathered by interviewing each elder separately. Also, a group of elders gathered to offer their ideas of what protocol

is about, from an indigenous point of view. The researcher followed protocol for each elder who participated in this research project. The oral traditional knowledge, willingly shared by the elders, gave the following theme conclusions: indigenous relationships, languages, history, and values. These themes are important in honoring and respecting indigenous peoples and their communities. This study recommends that: indigenous peoples develop protocols for their specific communities, that visitors should follow; design educational courses of study, by listening to suggestions from chosen elders; and create competencies for visiting professionals, so they better understand how to approach indigenous peoples and the communities they work for.

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Youth and tobacco studies with the Yellowknives Dene First Nations

Data was collected in partnership with the K'alemi Dene School in Ndilo, in March through May 2009. Students in the Grades 9-12 class received basic training in research objectives, ethics and procedures. These students developed a list of questions, that were used in preliminary interviews with other students from Grades 2-12. As part of these interviews, the student researchers were briefed on using disposable cameras to take pictures of tobacco use in their community, which is a research procedure called PhotoVoice. When the pictures were developed, the student researchers again conducted a short interview to discuss the pictures, using a set of questions developed with the class. They also collected this information from students at Kaw Tay Whee School in Dettah. The results of all the interviews were then put together and summarized for presentation back to the schools in October. The preliminary results were also presented at the 14th International Congress of Circumpolar Health in July 2009 in Yellowknife. Additionally, after working with a K'alemi student, an eBook of the PhotoVoice results has been prepared and will be distributed to students and the community at the K'alemi School Health Fair on January 22, 2009. Follow-up activities are under discussion with the research team.

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Region: GW, NS **Location:** Inuvik, Yellowknife

Strengthening Canadian capacity to maintain a stable circumpolar world: northerners' views on the Arctic Council and the idea of a domestic version

Based largely on interviews with key stakeholders, this research found that Canada's territorial governments and northern aboriginal groups consistently emphasize that Canada should constructively work with its arctic neighbours to build a more stable and cooperative region. To encourage more cooperation, these groups still strongly believe in the Arctic Council, which could be strengthened with: better communication of Arctic Council work to the public, a permanent body to organize the Council's activities, greater involvement of northerners in the acceptance of observers onto the Council, more funding for permanent participants, by creating more community involvement, and by increasing the human focus of the Council through the Sustainable Development Working Group. Amongst these groups, there is also a feeling that the current sense of worry about the Arctic in Canada has encouraged the government to largely ignore the northern voice in the development of the country's domestic and foreign policy for the region. To fix this problem: more meetings between key people and groups involved in the region should be held in the north; working groups with northern and southern involvement could be formed to address key issues; and the position of Ambassador for Circumpolar Affairs should be re-established and held by a northerner.

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Aklavik community economic sustainable development plan

In the Mackenzie Delta-Beaufort region of Canada, the sustainability of remote communities is important to the Inuit (Inuvialuit), Dene (Gwich'in), Métis and non-indigenous people. The goal of this research project was to both research and compile the requirements for the production of an Aklavik Community Economic Sustainable Development Plan (ACESDP). The hypothesis was, "Community economic sustainable development planning, involving community members, to develop a community economic sustainable development plan, can help to improve a community's work towards the achievement of economic self-reliance."

This project used a grounded theory methodology, using: face-to-face survey questionnaires, focus group sessions, participation and observation in community meetings, events and cultural activities, as well as secondary data to obtain information. A heavy emphasis was placed on researching and understanding the history of the aboriginal peoples of Aklavik. This was done to ensure that their views,regarding economic sustainable development, were understood to the greatest extent possible. The researchers also explored existing social and economic development (business) resources, as well as opportunities that are present in Aklavik. Other factors reviewed were: the socio-economic practices and traditional activities of the people; the government policies related to advancing aboriginal and northern (Canada) economic development; and the needs of the community and gaps in resources. This led to the identification of socio-economic priorities.

The outcome of the research was a research paper and the production of an Aklavik Community Economic Sustainable Development Plan, which is a plan owned by the community to assist it in advancing its vision for its future, with the support of its membership and other governments, agencies and industries.

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Region: IN, GW, NS, SA **Location:** Inuvik, Yellowknife, Behchokò, Tulıt'a

The rules of engagement? NWT negotiated agreements and environmental assessment

Increasingly in the Canadian north, resource development proponents are necessarily engaging in two parallel processes, with limited or no formal connection: the preparation of environmental assessments (EAs) for regulatory project review; and the negotiation of private agreements, often termed Impact and Benefit Agreements (IBAs), with regional First Nations. The informal connection between EA and negotiated agreements (NAs) has introduced uncertainty into the project review process, resulting in confusion and frustration for project proponents, regulators, and aboriginal communities. This undefined relationship also raises questions about the integrity of the EA process. For example, a completed NA could be perceived as an aboriginal community's tacit acceptance of the impact identification and mitigation planning contained in the project environmental assessment; in this way, NAs may actually reduce the scope of the assessment of the potential environmental or socio-economic effects of a project. While some constituencies assert that public processes like EA have no right nor need to concern themselves with private NAs, there is little doubt that, in practice, EAs are now taking place with the assumption that such agreements will be signed. EA processes and NAs do not necessarily have to be 'integrated', but the relationship between them needs to be better understood and more carefully designed.

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Region: IN, GW, SA, DC, NS, SS **Location:** Inuvik, Norman Wells, Fort Simpson, Yellowknife, Fort Smith

A performance measurement framework for closing the aboriginal student achievement gap in the Northwest Territories

Today's public service is facing increasing demand for accountability and transparency in the delivery of programs and services. Included in these responsibilities is the ability for government to demonstrate that its programs and services are achieving their expected performance outcomes. To respond to this call, the Government of the Northwest Territories (GNWT) through the Department of Education, Culture and Employment (ECE) has recently identified the need to develop a performance measurement framework for its Aboriginal Student Achievement (ASA) Initiative. As such, a consulting research project was undertaken to specifically address the research question of whether or not there is an effective and efficient performance measurement tool that ECE could adopt to evaluate program outcomes for the ASA Initiative.

A number of research efforts, such as in-depth literature review, primary research activities and an in-depth case study were conducted to complete this project. These varied research activities concluded that the Results-based Management Accountability Framework (RMAF) could serve as an effective and efficient performance measurement tool for ECE's Aboriginal Student Achievement Initiative in the NWT.

The research report recommended that ECE adopt the proposed RMAF developed for the ASA Initiative. It was further recommended that the RMAF be considered for possible application in other ECE programs and services areas as well. Finally, it was recommended that ECE consider further research on other alternative performance measurement tools to support the department's efforts toward continuous improvement in this area.

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Steps toward revitalizing the Gwich'in language through storytelling

This research involved a critical examination of the research literature on language revitalization and uses Jo-ann Archibald's Indigenous Storywork framework of the four R's: respect, reverence, responsibility, and reciprocity, along with interconnectedness, wholism, and synergy. Also the insight into Archibald's own reflections on ethics, principles, protocol, time, and synergy provided the guidance for this work. A component of this study involved learning from the elders in the community through a two hour focus group meeting, where elders were invited to share ideas for the potential use of stories as a way to engage youth in learning the Gwich'in language. A reason for developing a dialogue circle with elders is that the elders possess the traditional knowledge of storytelling. The elders have kept the stories alive and may have suggestions for how we might use storytelling to inspire students to learn the Gwich'in language.

This researcher met with five elders from the community of Fort McPherson on November 2, 2009. The elders shared their ideas based on the following four questions: 1.What do you think are aspects that need to be considered in revitalizing the Gwich'in language? 2. How could stories be used in the classroom to revitalize the Gwich'in language? 3. If you could choose three stories to share with students in the school, what stories would you choose and why? 4. What would you like the students to learn from the stories and how can we use these stories to revitalize the Gwich'in language? Research was completed on April 16, 2010 and a date will be set to meet with invited groups and elders to share her research and completed book project.

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Social networks as a livelihood strategy among K'asho Got'ine youth

This study looks into community responses (especially among youth) to a declining availability of barren-ground caribou in Fort Good Hope, NWT. Such responses were expected to occur in terms of harvesting (changing hunting practices), and meat distribution (sharing meat more or less widely, or differently). Fieldwork was conducted over four months in Fort Good Hope (autumn 2009), and involved researcher participation on two hunts: a barren-ground caribou hunt and a community hunt (targeting multiple species). Interviews with harvesters and sharers focused on the significance of hunting and sharing to community members (especially youth), while surveys recorded how the meat from each of these hunts was distributed. Preliminary results suggest that both hunting and sharing practices can involve the conscious encouragement of certain cultural values. When these values are widely shared, they may bolster community resilience to ecological changes.

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Assessing socio-economic tradeoffs: a study on Sahtu harvesting patterns of the Northwest Territories barren ground caribou herds

In 2009, the researchers conducted an analysis of 1998-2005 Sahtu Harvest Study Data for the communities of Déline and Fort Good Hope and scoped issues in the community of Déline (January-February 2009) to explore questions that may be asked during data collection. They also collected data regarding caribou harvesting trips during 20 in-person interviews with Déline harvesters (spring 2009), and regarding store bought foods, wage economy, annual caribou population trends (spring 2009). This study will continue in 2010, to allow for additional data collection and analysis.

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Fisheries co-management and adaptation in a changing arctic: a case study of dolly varden charrsubsistence fisheries co-management in Aklavik and Inuvik

This research looks into how land claims co-management groups like the Fisheries Joint Management Committee and Gwich'in Renewable Resource Committee work with communities to combine local knowledge with science, in making resource management decisions that support conservation goals, as well as other community concerns. Dolly varden charrmanagement was selected as a case study, because of its importance to the communities of Aklavik and Fort McPherson and concern for its decline. The research explored knowledge sharing between the network of local, regional, and government groups and how this worked to address the declining subsistence fishery. Interviews were held in person in Aklavik, Inuvik, and Fort McPherson with community members involved in fishing, the Aklavik Hunters and Trappers Committee and Renewable Resource Committee, Fort McPherson Renewable Resource Committee, Gwich'in Renewable Resource Committee, Fisheries Joint Management Committee, and Fisheries and Oceans Canada. Time was spent at fish camps and local resource meetings to observe and hear people's ideas, thoughts, and concerns about changes to subsistence resources and how to address it. Other important regional resource co-management meetings were also attended in Inuvik and Winnipeg. Follow up discussions with participants will occur this year. Preliminary results show that the network of relationships developed through the resource co-management process is an important avenue for the communities to be active in protecting the health of and access to important subsistence resources, even under changing conditions. The complex nature of migratory fisheries has required the integration of local knowledge and science to understand potential causes of population declines and develop responses at the community level that sustain this important food and cultural connection to it.

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Cultural sensitivity in programs for men who abuse

The history of programming for men who abuse in intimate relationships has not only been controversial, but also relatively short-lived. To date, the majority of research has focused on general populations. Identification of a culturally competent abuser program would prove beneficial to culturally unique populations. Perhaps, the most likely to benefit would be the indigenous populations within the NWT, who experience exceptionally high rates of domestic abuse in comparison to other populations across Canada. The challenge, however, lies within the definition of culture in that the idea of "culture" may be defined quite differently between any two individuals within the same ethnic community, thereby generating an interesting paradigm for programming development. This study uses content analysis to identify key elements within various NWT populations, that could be useful in informing the development of a culturally competent abuser program for the north. Themes including elders, ceremonial activity and residential school were significantly less discussed in interview responses. Further, findings note a distinct intergenerational gap in cultural definitions, as well as a difference in responses between Métis and people from a full aboriginal background. Finally, the results suggest that overall participants preferred to identify their culture based on land and language, and were more likely to share information within less formal contexts.

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Gwich'in perspectives of intergenerational resilience in Aklavik, NWT

The first half of the project "Gwich'in Intergenerational Resilience in Aklavik, NWT" has been done in Aklavik. The purpose of the research is to understand how different generations in the community are resilient to change. During the research, participants said that to be resilient in Gwich'in and Inuvialuit cultures is to be strong and to never give up or give in. This meaning of resilience is what is used in the research. The researcher stayed in Aklavik from August to November 2009. While in Aklavik, the community research team held two focus groups with youth and elders. The research team interviewed 28 people in total: 9 youth, 8 adults, and 9 elders. Before results can be made public, each interview must be returned to each participant to make sure the participant is comfortable with everything that was said. The researcher is planning to do this between September and November of 2010. The research team will hold community meetings and focus groups to present ideas and ways to present the results of the research most meaningfully to Aklavik.

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Arctic contaminants: exploring effective and appropriate communication between Inuvialuit communities and researchers

This study is highly relational, thus requiring extended periods of time spent in Sachs Harbour, to ensure that the project accommodates the lives of the participants. The first trip to Sachs Harbour from July 20-Aug 21, 2009 allowed researchers to make initial personal contact, begin a dialogue about the project, identify some interested community members, and set up the framework for following visits. Interview and focus group discussions will be conducted in November 2009 (due to unforeseen delays, it did not begin in October, as expected) and February-March 2010. Storyboarding and editing are expected to begin April-May 2010, with subsequent trips in summer and autumn 2010 for final editing, video production and evaluations. The final video presentation will likely occur in early 2011. The objectives, methodology, time period, and impacts of this study have not changed.

The possibility of making this project more accessible for youths was investigated, and the Joint-Faculty Research Ethics Board at the University of Manitoba approved the amended changes. These amendments require parental consent for interested youths under age 18, allowing them to be involved in video and interview work. Participation is never mandatory, nor expected, and there are no anticipated risks for participants.

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Location: Inuvik, Aklavik, Fort McPherson, Ulukhaktok, Tsiigehtchic, Tuktoyaktuk

Take it from the top: northern perspectives on southern Canada, newcomers to the north, and their land and people

To begin the research year, Denis Allen came to Inuvik to work with the student research team for one week. Students completed a "Mini Film School" and a few short features were created. These skills were put to use from February to June, when students worked on individual and group research projects focusing on northern themes. Filming also extended into Aklavik, Tuktoyaktuk and Tsiigehtchic. In July, the completed 12 short films were premiered at the Open Sky Film Festival and the Great Northern Arts Festival. Over the summer, three students continued to research, and edited the interviews from all the student researchers' interviews into the following three film segments: "Northern Studies", "North to South" and "Southern Studies". The summer students also pursued personal projects on the Northern Games, residential school and modern northern life. In August, the research team traveled to Edmonton to conduct fieldwork on southern culture. This was a huge success. The reporting phase of the research began in the fall, when the research team traveled to Whitehorse to present at the ACUNS conference and to Yellowknife to present at the Northern Policy and Governance Conference. The video project is largely in post-production and moving into the feedback stage.

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The evolving relationship between the social economy and the state in Yellowknife, NWT

This project explores the relationship between governments and voluntary and nonprofit organizations in Yellowknife, NWT. Policies and programs at the federal, territorial, and municipal levels were considered. Research in the community was completed between June 2009 and February 2010. Researchers conducted interviews with government officials and managers of voluntary organizations. The past five years have not been easy for Yellowknife's voluntary and nonprofit sector. Declining government support, a struggling private sector, and a global recession have all taken their toll on the size and health of the sector. Challenges include a tight labour market and a high cost of living; the absence of core and multiyear funding; a lack of recognition for sector activities; a need for increased training opportunities; and, the absence of a coordinating body for sector activities and advocacy. Yellowknife's sector has also failed to adequately engage indigenous persons in leadership roles, as well as in offering programs and services to Ndilo and Detah. Results are presented in a report delivered to the public in summer 2010. Results will also be communicated through journal articles and conference proceedings.

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Location: Délı̨nę, Yellowknife, Fort Resolution, Hay River, Hay River Reserve, Łútsęlk'é

Abandoned mines in northern Canada: historical consequences and mitigation of current impacts

In August 2009, the research team met with Hay River Métis Council (HRMC), Katlodeeche First Nation Council (KFNC), Deninu Kue First Nation Council (DKFN)

The HRMC was enthusiastic about the research, and agreed to assist with the oral history component, putting the team in touch with people who worked at the Pine Point Mine. The Chair of the HRMC guided us on a site visit to the former Pine Point Mine. Photographs and video footage were taken, which have since been edited into a short film on the history of the mine. The film can be viewed at http://www.youtube.com/watch?v=DgY6biryzQc.

We also received a very positive response to the project from DKFN, with community members expressing concerns over the impact of the mine on local water bodies, in particular. At a community meeting, the researchers shared some of the video footage they had taken at the mine, which interested several young people, in particular, who had never been to the site.

In our meeting with the KFNC, concern was expressed about how we would respect their protocols around Traditional Ecological Knowledge. We agreed to explore the idea of having project team members take a cultural awareness course at the Dene Cultural Institute. We agreed to work with the Chief, council, and staff to develop a research plan for the following season.

The researchers spent some time in Yellowknife conducting research at the territorial archives. They also met with the Environment, Lands and Resources Coordinator for the North Slave Métis Alliance, as well as informally with several employees in the Lands and Environment Office of the Yellowknives Dene First Nation. Finally, they visited the accessible parts of the Giant Mine site, taking video footage and photographs, with the eventual goal of producing a video/slidecast for the benefit of our community partners and the public at large.

The researchers have been working with all of these contacts, with the eventual goal of developing a research plan for the oral history component of the project in summer 2010.

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Multimedia and print dictionary of Tlîchô Yatîi

The goal of the research was to work on revising a print dictionary and expand the on-line dictionary of the Tlîchô language. Other goals were language and research training, both at the university and in the community.

Activities completed under this research project included editing dictionary verbal entries to standardize the dictionary form across all dictionary formats. The children's dictionary (1995) was used as a model because it is the clearest. This decision was approved by TCSA staff. A University of Victoria student began this work in a small number of hours during the year, but she took another job and didn't continue. This work is not yet completed.

Researchers also worked on checking audio files and orthography for dictionary items appearing in the on-line database. This work is not yet completed. Final edits were made to the Tåîchô K'ëë Ets'eetå'èe xè Enîhtå'è K'e Yats'ehtii / Reading and Writing inTåîchô Yatiì (January 2010 publication). Completion of this work was not formally part of this project; however, completion of this textbook supports dictionary research and community learning as it provides a reference book for use by all Tlîchô readers and writers.

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Region: DC, SS **Location:** Fort Liard, Fort Providence, Fort Simpson, Jean Marie River, Nahanni Butte, Trout Lake, Wrigley, Enterprise, Fort Resolution, Fort Smith, Hay River, Hay River Reserve, Łútsę̀lk'é, Kakisa

The genographic project: anthropological genetic analyses of indigenous human populations of North America - South Slave and DehCho

During July-August 2009, the researchers conducted extensive outreach with a number of aboriginal communities in the South Slave and DehCho region. Through telephone calls and emails, they contacted persons from DehCho and South Slave First Nations in an attempt to arrange a meeting with their chiefs and tribal councils in August. These groups included the Katlodeeche First Nation, Smith's Landing First Nation, Liidlii K'ue First Nation, Acho Dene Koe Band, Deninu K'ue First Nation, Lutsel K'e Dene Band, Sambaa K'e Dene Band, Pehdzeh Ki First Nation, Nahanni Butte Dene Band, TthedzehK'edeli First Nation, and Ka'a'gee Tu First Nation. In addition, the researchers communicated with the Northwest Territories Métis Nationabout their possible interest in the project. Since that time, the Liidlii K'ue First Nation has sent a letter approving its involvement in the project, and discussions are underway regarding their availability to work with the research team in 2010. However, the researchers are still waiting to hear from the rest of these groups, but will check back with them towards the end of 2009.

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File No: 12 410 845
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Location: Colville Lake, Délı̨nę, Fort Good Hope, Norman Wells, Tulıt'a, Gamètì, Behchokò, Wekweètì, Whatì, Yellowknife

The genographic project: anthropological genetic analyses of indigenous human populations of North America - North Slave and Sahtu Dene

In late August, the researchers met with the Tåîchô Community Services Authority in Rae and discussed how to move forward with project related work, and coordinate efforts in the different Tlicho communities. They were enthusiastic about the project, and saw real benefits for capacity building and research training for members of CART, who would work with the researchers to carry out data and sample collection. The research team agreed to carry out Genographic Project research in January 2010, and are now beginning to make arrangements to undertake this joint effort.
In addition, the researchers spent two weeks in mid-August discussing the project with members of the Tulit'a Dene Band, and affiliated organizations from Norman Wells and Tulit'a that will collectively decide whether to participate in the study. They also met with a member of the Fort Norman Métis Land Corporation, and his organization approved its involvement in the project. The research team is now following up these conversations with these organizational leaders, to determine how the project might be carried out in their communities. They had indicated that dates between late November 2009 and early February 2010 would be feasible for them to participate in the project.

During this same period, researchers attempted to arrange a visit to the Délı̨nę First Nation, but this meeting did not come to fruition. However, a line of communication was established with the Band Manager, and the researchers will follow up on the initial email exchange with further correspondence, in which they will outline the process of conducting the project in Déline.

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Location: Délı̨nę

Déline abandoned mines - learning for the future

This project is linked to the broader three year program under ARI License #14550 (Abandoned mines in northern Canada: historical consequences and mitigation of current impacts, Dr. John Sandlos). The project is led by the Délı̨nę Knowledge Project in collaboration with Orlena Modeste, Délı̨nę Remediation Office, and Dr. Anna Stanley, University of Ireland (Galway).

Déline is unique in having already accomplished a major oral history and scientific research program, related to the history of mining on Great Bear Lake. The vision of the elders is that younger generations can learn from this experience about how to deal with change, and how wise decisions can be made for the future.

During December 8-10, 2009, a two day focus group was held to discuss the history of mining on Sahtu' (Great Bear Lake), in the context of indigenous experiences with mines elsewhere, and with a view to defining future research needs. Results were presented at a one day workshop with the science class at Ehtse'o Ayha School. The focus group and workshop report includes a recommendation for a future project involving students in research with elders. This recommendation was approved by the De'lineFirst Nation office.

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Region: SA **Location:** Délı̨nę

Health risk and climate change in Sahtúot'ine stories: envisioning adaptations with elders and youth in Déline, NWT

During 2009, the Délı̨nę Knowledge Project led research sponsored by Health Canada's Climate Change and Health Adaptation in Northern First Nations and Inuit Communities Program. The research followed from the earlier program The Words of Our Ancestors are Our Path to the Future. The goal was to explore how Sahtúot'ine stories are used to identify, analyze and address health risk in the context of climate change. Methods included storytelling contests in the community and activities with the school, using various techniques for sharing and representing stories, including traditional storytelling, radio, digital storytelling, digital mapping and language documentation. The research was linked to a scientific climate monitoring project on Sahtu' (Great Bear Lake), led by the De'line Renewable Resources Council and sponsored by International Polar Year. The research was discussed during two research workshops in April and June. Outcomes include a web-based language database, a Dene placenames map, a number of digital stories, a CD compilation of youth radio programming, a youth website (www.delineradio.com), and a De'line Knowledge Project website (under construction). The first academic paper based on this research is being prepared with Dr. Keren Rice, Department of Linguistics, at the University of Toronto.

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Region: SA **Location:** Palmer Lake and Norman Wells

Dene and Métis ways of respecting the land: caribou traditional knowledge study

In partnership with the Department of Native Studies at University of Manitoba, the Sahtu Renewable Resources Board (SRRB) has sponsored a multi-year traditional knowledge study, to explore Dene and Métis perspectives on caribou monitoring and stewardship. During 2007-2008, study activities took place with the communities of Délı̨nę, Fort Good Hope, Colville Lake and Tuli't’a. In 2009, the Norman Wells Land Corporation (NWLC) and Renewable Resources Council sponsored a study on mountain caribou. Youth, adults and elders from Norman Wells and Fort Good Hope participated in a harvesting trip to Palmer Lake, during August 22-29. A second phase of the project, in partnership with Mackenzie Mountain School, was a digital storytelling workshop with Dawn Ostrem and Robert Kershaw, of the Centre for Digital Storytelling (www.storycenter.org). Synthesis of the five projects has begun. Research products include a preliminary review of management and policy implications (January 2010), a manuscript in progress co-authored with Walter Bayha and Dr. Frances Abele entitled “Living with caribou: Dene knowledge and policy development in the context of ‘crisis’”, and contributions to a forthcoming book, co-edited with Dr. Brenda Parlee and Dr. Ken Caine, Rethinking caribou: the social-ecological complexity of community-caribou relations in Canada’s Western Arctic (UBC Press).

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Region: IN, GW, SA, DC, NS, SS **Location:** All NWT

Mapping the social economy in northern Canada – Northwest Territories project

The purpose of this project is to develop an inventory of social economy organizations in Nunavut, the Northwest Territories, Yukon, Nunavik and Labrador. Social Economy (SE) groups are mostly non-profit organizations, including advocacy groups, voluntary organizations and other community-based organizations such as cooperatives. Social economy organizations produce goods and services for members and community with a clear social mission. They put people as priority over capital. Their management is independent of government, and workers and/or users use a democratic process for decision making.

To get a clear picture of what and how SE groups operate in these northern territories a questionnaire was developed and distributed by email and mail in 2008. Over 400 groups were identified in the Northwest Territories as being part of the social economy. The response rate was low but thought to be representative of the types of SE groups operating in the NWT. A paper summarizing this data was published in the April 2009 Northern Review Journal. A copy has been sent to the Aurora Research Institute. Results from the survey were also presented at a workshop in Inuvik in June, 2009. The presentations from this workshop are available on the Social Economic Research Network of Northern Canada (SERNNoCa) website. Additional social economy groups were identified for the Inuvik region at the workshop and have been included in the list.

A second condensed questionnaire was developed in order to get greater input by SE groups. The questions seek to determine types of organizations, main activities, the number of people involved, governance structures, amounts and types of funding, as well as challenges faced for training, getting volunteers and finding funding. Details of the questionnaire and other aspects of the study are available on the SERNNoCa website.

The results of this study will be communicated widely to individuals and communities in the north through SERNNoCa newsletters, summary reports and public information sessions. The point of contact in the NWT is the Institute for Circumpolar Health Research (ICHR). The research team continues with the survey work which is seen as an ongoing process for the project. The list of social economy groups is being reviewed and updated by the NWT coordinator at the ICHR. SE groups in the NWT will be contacted by phone to get additional survey responses over the next year. The continuation of this research is to improve responses from organizations to get a better understanding of the numbers, size and types of social economy groups that operate in the north. The intent is to show government and others the importance of these kinds of organizations in sustaining northern communities.

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Partnering with parents and community members in education

Among Inuit leaders across Canada, there is a growing recognition of the need to engage parents and community members in supporting the education of their children. The purpose of this research was 1) to use scientific survey research, not only as a data gathering exercise, but also as a process to form a partnership between the school and the community, and 2) to build the capacity that would enable community members to acquire the skills necessary to undertake survey research. High schools students and community members in Paulatuk, NWT were trained to conduct survey research. They carried out a survey in Paulatuk that asked every community member to answer questions about their own experiences with education, their feelings about education in general, and their hopes for the education of their children. Results revealed strong support for education, in that over 90% of respondents reported that education is important for their children. Respondents also indicated that, although they believed education to be important, they did not always engage in behaviours that matched these beliefs. An ongoing feedback process involves community members presenting the results to everyone in the community and using these results to stimulate a partnership between the school and the community.

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The impact of participation in the wage economy on traditional harvesting, dietary patterns and social networks in the Inuvialuit Settlement Region

In July 2009, the student researcher conducted a small workshop in Paulatuk. The goal of the workshop was to understand food security issues in the community, including: a) the ability of community members to harvest traditional foods from the land, b) what makes it easy and what makes it hard for community members to access healthy and/or affordable foods from the store, and c) other factors that affect access to healthy and culturally appropriate foods in the community. Cost and availability of nutritious store-bought foods is a recurring theme in the interviews conducted in 2008 and the workshop conducted in 2009. There is also concern about the impact of wildlife quotas on food security in the community. The high cost of gas, equipment and supplies for harvesting has an impact on access to traditional foods. The relationship between work and harvesting - which impacts food security - is also important.

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Location: Łútsę̀lk'é

The rangifer anatomy project: linking community and scientific approaches to caribou structure and function

In March 2009, the researcher was invited by the community of Lutsel K'e, in the Northwest Territories, to come to the school and discuss his work on the Rangifer Anatomy Project, based out of the University of Saskatchewan and the University of Calgary, and participate on a community caribou hunt. The researcher spent an afternoon in the school and presented his research to the high school students and showed a video on community-based caribou health monitoring. Along with University of Calgary anatomist Dr. Christoph Muelling, the researcher travelled by snowmobile with Lutsel K'e residents to their camp at Artillery Lake for one week, to participate in the caribou hunt. Local hunting and butchering techniques were observed, and youth were shown how to collect blood samples for health monitoring. The researchers also observed and videotaped some of the women in camp butchering caribou and explaining the local names for all of the caribou parts. Elders were interviewed about caribou health and stories were recorded of traditional caribou uses and how caribou were managed traditionally. The researchers also engaged youth in dissections and sampling from a caribou in camp and shared discussions with many community members while camping together on the land.

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Research of mraditional medicinal floral resources within Acho Dene Koe First Nation's Traditional Territory and the impact of climate change

Historically, Acho Dene Koe First Nation (ADKFN) community members relied on the native indigenous edible and medicinal plants for their survival within their traditional use and occupancy territory. However, with global warming, climate change, changing weather patterns, and new invasive terrestrial species threatening our indigenous edible and medicinal plants, the researchers have located, collected, identified and documented the many existing edible and medicinal floral resources within certain locations of the ADKFN's territory.

Consultants, elders, community members and youth participated in this project. The main research activities included collecting plant specimens, preserving them using proper drying techniques and storage, and documenting the plants in hundreds of pictures and recorded their locations with GPS coordinates.

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Cisco diversity in Great Slave Lake .
The Committee on the Status of Endangered Wildlife in Canada has assessed the status of the shortjaw cisco (Coregonus zenithicus) as 'Threatened' under the Species at Risk Act. Recent studies suggested that this species exists in Yellowknife Bay (Weledeh), Great Slave Lake (Tinde'e). The Species at Risk Act explicitly states that: "The traditional knowledge of the aboriginal peoples of Canada should be considered in the assessment of which species may be at risk and in developing and implementing recovery measures". To date, Canada does not have an effective mechanism for accomplishing this requirement.

Yellowknife's Dene have traditionally relied on fish and caribou, as principal components of their subsistence. In August 2009, Yellowknife's Dene First Nation held a fish camp, to document local traditional knowledge on cisco in general, and the shortjaw cisco in particular. A secondary goal of the camp was to collaborate with western scientists, in an attempt to pilot test a method for engaging First Nation communities and facilitate the mutual exchange of knowledge, as it pertains to Species at Risk. To achieve these goals, Yellowknife's Dene First Nation elders were engaged in on-the-water fishing activities with fisheries biologists. These activities were supplemented by a number of group discussions that were led by the elders and fish processing workshops that were led by the biologists to provide a deeper level of knowledge.

The methodology employed during this pilot study helped identify several important factors to consider in future programs; most importantly, the need for flexibility to be built into data collection tools and the agenda. Unexpected weather conditions may affect the ability to carry out some research activities, and as the methodology was largely directed by participants, their desires and salient attitudes can reveal important factors to consider that researchers may not anticipate. In this study, we found that participants focused much more on general concepts of natural resources and fisheries management, rather than specific characteristics of the cisco. Because cisco are not traditionally used as a significant food source by Yellowknife's Dene, it is possible that more detailed information would be yielded regarding species that are primary food sources.

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Region: GW, DC, NS, SS **Location:** Inuvik, Fort McPherson, Fort Providence, Yellowknife, Fort Smith

Indigenous women, ways of knowing and aesthetic of beadwork

Objectives of this research were to a) share experience, as a researcher visiting the Pitt Rivers Museum, University of Oxford, to study a pair of moccasins made by the researcher's grandmother at her home in Fort Smith, Northwest Territories in 1942 (completed); b) facilitate a beading circle with urban aboriginal women in Edmonton, Alberta, to document the contribution of beadwork to aboriginal women's health status (completed); and c) conduct interviews with elderly aboriginal women in Alberta and the Northwest Territories about their experiences with beadwork.

The researcher worked to examine the perspectives of indigenous women, concerning their participation in traditional cultural activities, such as beadwork, to explore how participation by indigenous people in traditional cultural activities contributes to individual development, identity formation, establishment of teacher/learner relationships, and relationships to social and cultural environments. This study draws attention to the many contributions of aboriginal women in the north and elsewhere, whose legacy is a rich endowment of materials created and crafted by them, from which future generations may continue to learn about indigenous ways of knowing and being. Analysis and reflection upon indigenous ways of knowing, teaching and learning may contribute to the understanding of individual development and the health and well-being of indigenous women.

Project methods include indigenous knowledge and research methodologies, ethnographic and critical inquiry, visual arts and representation, and qualitative, participatory and community-based research methods. A series of 2-4 interviews, 2-3 hours in length, will be conducted with 4-8 women in each community. Consent for use of content and images will be obtained from each participant. Participants will be provided with the opportunity to review the interview transcript. Fieldwork research will be documented using photography, audio and video recordings.

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Climate change impacts on Canadian arctic tundra ecosystems – North Slave Métis community traditional knowledge study

As part of a larger IPY project entitled "Climate change impacts on Canadian Arctic tundra ecosystem" (CiCAT), the North Slave Métis Alliance visited three tundra locations (Artillery Lake, Aylmer Lake, and Yamba Lake) and one boreal site, Old Fort Rae, to collect both scientific and traditional observations of the state of the vegetation, terrain and climate in the North Slave region. Scientists conducted scientific sampling of vegetation and soils, to provide baseline data to contribute to government and academic research partners, while elders contributed traditional knowledge on the sampling techniques and observations on the changing environment. The two worked together to share information on scientific and traditional knowledge and sampling techniques. Results contribute to the ongoing analysis of this multi-year project and indicate a general warming and drying trend for tundra soils and vegetation, with concurrent changes in plant, insect and other animal behaviours. Bringing together these two forms of knowledge, the goal of the research is to better understand the changes that have occurred and assist the North Slave Métis People in preparing for changes that are soon to come.

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Aulavik archaeology and traditional knowledge project (traditional knowledge component)
In 2009, Hodgetts returned to Sachs Harbour and Aulavik National Park, in order to ask the assistance of Inuvialuit elders in identifying "unknown" archaeological features recorded in a previous trip. She also conducted an initial land use mapping interview, to document knowledge of animal movements on Banks Island, and particularly within the Park. It is hoped that this interview will be the first of many that will use living memory to help to develop a better understanding of animal behaviour and exploitation on the island.
Hodgetts asked community elders to determine the function of the "unknown" archaeological features based on photographs of 40 different features taken in the field in 2008. The elders agreed about the function of the features in many cases, butthey also frequently had different interpretations, and in many cases they were simply unsure. Identifying features from a two dimensional photograph proved to be challenging as it is hard to get a sense of the true size and shape. The archaeolgical record of Aulavik added some further uncertainty. The site involves stone features on a post-glacial landscape littered with stones, which makes it difficult to be sure which stones are part of a feature and which are not. People have also remade and reworked these features into other features over time. These features were often used to hold down larger structures made of skins, and could lose their shape when the skins were dismantled.

Thanks to helicopter support from the Polar Continental Shelf Program, Hodgetts was also able to revisit some of the "unknown features" with the elders and video recorded the elders' descriptions and interpretations of the sites in question. Site visits can easily overcome the interpretive problems associated with scale, but still face the problems of archaeological interpretation as well as differences of interpretation based on the life experiences of individual elders.

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Region: NS **Location:** Gamètì, Wekweètì, Whatı

Past and future fire dynamics: implications for central arctic caribou and dependent communities (community based component)
In 2009, research was conducted throughout May and June in the NWT. Upon arriving in Yellowknife, logistics were arranged for one month of research in Whati and Wekweètì. In order to establish better connection within the Tlicho government and communities, the researcher spent much time in Bechoko.

From June 10th to June 20th research was conducted in Whati. An assistant/ translator, who knows the community, was hired to set up the time and place for each interview. Through semi-structured interview techniques, eight elders and knowledge-holders were interviewed. From June 24th to July 6th, research was conducted in Wekweètì. There the researcher hired an assistant/ translator who knew the community and set up the time and place for each interview. Interviews were done with four elders and knowledge-holders with the translator, using a semi-structured interview technique.

Generalized preliminary results indicate that caribou stay away from areas burned by fire for up to 5-10 years, but in some cases up to 20 years, depending on the intensity of the burn. Caribou stay 30-40 miles away from burned areas and usually travel a northern route. Climate change indicators were also recorded, which is involved with changes in caribou population and movement.

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Region: NS **Location:** Yellowknife

Dogrib language documentation and revitalization in Yellowknife, Northwest Territories

This project consisted of three main activities: (1) text collection, (2) text transcription, and (3) verb paradigm elicitation. For (1), elders from the community were invited to come to the Goyatiko Language Center and tell stories about traditional activities and local history. Text transcription, (2), took up most of the time for this project. The researcher was able to transcribe a rather lengthy story, "The Founding of Yellowknife," by a 96 year old elder. The final product came to 14 pages, in Roman script and syllabics, with a running English glossary at the bottom of each page. This story will eventually be combined with other stories into an intermediate level Dogrib language reader, for language learners.

Finally, the researcher collected a number of verb paradigms, which he will use in his doctoral dissertation on Dogrib phonology. Eventually, these paradigms will also become part of a verb dictionary, which will aid literacy, when speakers will be able to look up how to spell many of the complex verb forms of the language.

In addition, the Principal Investigator taught a two week Introduction to Linguistics course at the Goyatiko Language Center, with content focusing primarily on Dogrib and Chipewyan, the two main local languages. There were approximately ten students, and the course covered basic phonetics, phonology, and structure of the Athabaskan verb.

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Bioaccumulation of perfluorinated compounds in the vegetation-caribou-wolf food chain - traditional knowledge

This work is a part of a study on contaminants in a northern terrestrial environment. The study looked at barren ground caribou, specifically the Porcupine Caribou Herd (PCH), their food, and a major caribou predator, the wolf. The study also looked at culture anthropology. The on-the-land experience of the interviewees was recorded, both verbally and on maps.

Gwich'in people's traditional knowledge (TK) is inseparable from responsible harvesting of caribou; as such, erosion of TK, as the way of life changes, introduces ecological stresses (apart from socio-economical stresses). A lot of the TK deals with propriety, specifically in regards to harvesting. The elders talked about when to hunt, which animals to leave alone, how to maintain tidy practices, etc. The language reflects this holistic approach; for example, there is a special word for the place where caribou settle down for winter: Vinijàatan. This word represents a lot more than a place; the caribou herd spreads in winter, and where caribou groups decide to winter changes according to annual conditions. Failure to know where Vinijàatan has meant great hardship for the people.

The TK on wolves is especially interesting, considering some are linked to migrating prey, as opposed to territorial wolves. These migratory wolves travel much longer distances than territorial wolves. The TK shows that they migrate with the caribou; "It follows the caribou, it lives with the caribou," said one of the elders.

The direct on-the-land experience of the interviewees extends as far back as the early 1940s. This period overlaps significant changes in human impacts, due to motorization, and to climate change. The impacts of these changes on the land in general, and on caribou in particular are considered.

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Cumulative impact monitoring program - community-based monitoring sites and traditional knowledge science camp

In the summer of 2009, the research team set up permanent monitoring plots in the Mackenzie Delta region near the communities of Inuvik, Aklavik and Tuktoyaktuk. At each of these sites, they are monitoring vegetation, permafrost and weather conditions. Youth and land-users from each community assisted with site set up and collecting data. These sites will be revisited to monitor for changing conditions in the future.

As follow up to a traditional knowledge workshop regarding the dead zone sites held in Aklavik in March 2009, the researchers held a traditional knowledge/science camp to further discuss the dead zones. Elders, community members and youth from Inuvik and Aklavik met with Indian and Northern Affairs researchers in a camp on Harry Channel in the outer delta to build upon the March 2009 workshop. A combination of group discussions at different sites and at camp, along with some directed interviews were used to gather information. Many related topics were explored, including the challenges and possible solutions associated with community based monitoring programs; impacts of seismic work; recommendations for future research and traditional knowledge/science camps; local ecological knowledge of climate, weather and permafrost; and scientific research in sumps, dead zones and other biophysical features.

There was a community tour to all three delta communities held in February 2010. The meetings were attended by the Hunters and Trappers Committees (HTCs) and other community members. INAC researchers provided an update on the previous year's Cumulative Impact Monitoring Program (CIMP) monitoring program and Dead Zone Traditional Knowledge/Science Camp. They also gathered feedback and concerns from the community members. The meeting also explored possible future CIMP activities and next steps for this project.

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A case of access: Inuvialuit engagement with the Smithsonian's MacFarlane Collection
The MacFarlane Collection, housed at the Smithsonian Institution in Washington, DC, was purchased by a Hudson's Bay trader named Roderick MacFarlane from the Anderson River Inuvialuit, during the 1860s. Inuvialuit have had very little access to these objects, since their collection. This project seeks to facilitate the process of Inuvialuit engagement with the collection, through a community-driven process. The 2009 segment of the project, conducted November 13-22, brought a small contingent of Inuvialuit community scholars (elders, cultural practitioners, and youth), alongside anthropologists and filmmakers, to the Smithsonian Institution to participate in an extended workshop. The group spent a week becoming familiar with the MacFarlane Collection, documenting the elders' knowledge, and identifying additional sources of information about the collection to pursue. These sources include archival materials, related collections, and the knowledge of specified elders and cultural experts. Youth members of the delegation helped to document their elders' knowledge and learn videographic and ethnographic recording techniques. Planning discussions took place to identify the best avenues for sharing information about this collection with the broader Inuvialuit populace. Outreach activities, magazine and academic articles, and the development of educational web resources are planned in coming years.

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Circumpolar flaw lead system study - team 10, traditional knowledge study

Team 10 research efforts in 2009 focused on the development, coordination and completion of community interviews in Sachs Harbour, Paulatuk and Ulukhaktok. This comprised of community-based field programs involving semi-directed interviews, a mapping component, and database development and input.

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Region: IN **Location:** Paulatuk

Oral history project Paulatuk Roman Catholic Mission House and Notre Dame de Lourdes Grotto (nomination as a national historical site)

Fieldwork was conducted between 17 November and 23 November 2009, during which 25 community members were interviewed. We reached our goal of learning about the significance of the Roman Catholic Mission House and Notre-Dame de Lourdes Grotto at Paulatuk for community members, through their experiences and recollections of various events associated with the mission. We documented various aspects of the history of the mission, related but not limited to subjects such as religious life, social welfare, medical care, social and economic issues and the lasting legacy of some of the missionaries who worked and lived in Paulatuk. The mission house was, and remains, important for many reasons: the missionaries fulfilled a religious need; it was a place where people were always welcomed that would offer shelter, warmth, food, celebrations, friendship, comfort and solace. The store operated by the missionaries provided essentials goods that otherwise would have been unavailable in the region, and it is because of its history and excellent location, that the site was later chosen to become the location of the permanent settlement. This site also tells the story of the extremely positive relationship between the people of Paulatuk and the Oblates who lived among them.

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File No: 12 410 830 **Licence No:** 14475
Region: IN **Location:** Inuvik, Sachs Harbour

Inuvialuit perspectives of polar bear population health and harvest sustainability

In collaboration with the community of Sachs Harbour, the researcher, Dan Slavik, conducted interviews with 25 individuals to discuss their knowledge and observations of factors that influence the polar bear population health on Banks Island. The purpose of this study is to document traditional and local knowledge about polar bears, as well as gain a better understanding of how traditional knowledge, community observations, scientific studies, and other information interact to inform local peoples' harvesting decisions of polar bears.

Fieldwork took place in Inuvik and Sachs Harbour from March-May 2009, allowing the researcher to not only interview residents, but also to participate as an observer in subsistence polar bear hunts – an important opportunity to travel and learn on the land/ice from experienced hunters. Several of the interviews were video recorded with the hopes to produce an educational video for the community and Inuvialuit Settlement Region documenting elders' knowledge of polar bears, the land, and the ice.

Currently, Dan Slavik is analyzing the interviews and writing results. In fall 2010, he will be returning to Sachs Harbour to conduct small focus group interviews with hunters and share some of the early findings of the study.

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File No: 12 410 700 **Licence No:** 14528
Region: NS **Location:** Behchokò

Temporal distinctions in Dogrib grammar

During summer 2009, Nicholas Welch worked with two Tlicho translators and interpreters to try to discover how the two Tlicho Yatii 'be' verbs (ts'iili and ats'iit'e) are used with adjectives. Mr. Welch proposed sentences in English, which the translators turned into Tlicho Yatii; he also proposed sentences in Tlicho Yatii, which the translators judged for grammatical correctness. The results show that there are at least four factors at work. First, ats'iit'e seems to give a more "permanent" sense to adjectives. Second, ts'iili may only be used with living subjects, not non-living ones. Third, adjectives that modify nouns for living things actually behave like relative clauses (such as the English 'a person who is shy' rather than 'a shy person'). Fourth, only living plural subjects are allowed with plural verbs; non-living subjects cannot occur with plural verbs.

These results seem to show that Tlicho Yatii adjectives behave grammatically very much like verbs, although they have no past or future tense without ts'iili or ats'iit'e. This indicates in turn that ts'iili and ats'iit'e contribute to differences in the grammar between (a) permanent and temporary; (b) living and non-living; (c) present and non-present, and (d) singular and plural.

Andrews, Tom
Prince of Wales Northern Heritage Centre

Permit No.: 2009-019	**Class**: 2
Region(s): SS	**Location**: Mackenzie Mountains near the NWT-YT border

NWT ice patch project (2009)

Work this year focused on firming up our list of patches to be monitored over the coming years. To do so, we visited several targets identified by examining Google Earth imagery, as well as several that were further out from our core area. In the end, we were able to identify 20 target locations (8 of which have produced artefacts), which we will continue to monitor in future.

Significant finds this year included the remains of a birch arrow. In 2007, we located two mid-shaft fragments of the same arrow; this year we found both the distal and proximal ends and were also able to recover the fletching(the three feathers that were originally attached to the proximal or knock end). Unfortunately, the feathers were no longer attached to the arrow, but were lying immediately beside it in the caribou dung.

We also located a sheep fence. At nearly 800 metres long, the fence, which is still clearly visible, took advantage of a nearby salt lick that attracts both sheep and caribou to the area. Running along a flat river bench in the direction toward the lick, the fence turned abruptly down slope into a corral on the next bench below. Elders had mentioned a sheep fence in the area so we were pleased to be able to confirm its presence. Based on descriptions from Tulita elders, the fence may have been used for both caribou and sheep. As we were leaving, we noticed a second, much older adjacent fence that had been invisible to us on the ground. We landed again to map and sample this fence, though it is much shorter and poorly preserved.

Arnold, Charles
Prince of Wales Northern Heritage Centre

Permit No.: 2009-018	**Class**: 2
Region(s): IN	**Location**: Banks Island, SE along the shoreline from Sachs Harbour

Beaufort Sea archaeology project

Over a two week period in the summer of 2009, investigations were conducted at an archaeological site (OkRn-1) near Fish Lake on southeastern Banks Island, NWT.

The Fish Lake archaeological site was first reported by Thomas Manning, who undertook a scientific reconnaissance of Banks Island on behalf of the Defense Research Board of Canada during the summers of 1952 and 1953. Manning noted the remains of eight whalebone houses, near the edge of a 20 metre high cliff overlooking the Beaufort Sea, that he assumed (correctly) were from the Thule culture. The PWNHC, through its participation in the Inuit History Project coordinated by the Canadian Museum of Civilization, is documenting evidence of the Thule culture on southern Banks Island, and undertook the 2009 investigations to learn more about this site, and to assess the potential for further, more detailed, excavations.

Our goals for the brief field season were to prepare an accurate map of the site, conduct test excavations to determine the depth and state of preservation of cultural remains, and to recover datable artifacts or organic materials. These goals were all met. The site was successfully relocated, and a map of the eight (and possibly nine) house remains was prepared. Test excavations in two of the houses and in a midden deposit revealed that well-preserved cultural remains are found at a depth of approximately 50 cm. Three radiocarbon dates point to a date of about 1600 AD, which is corroborated by the styles of several antler arrowheads that were recovered. This period of Thule history is poorly known in the local area, and the site has a high potential for revealing adaptive strategies employed by Inuit in the western Canadian Arctic during the early stages of a cooling climatic episode that undoubtedly impacted resource availability.

Benson, Kristi
Gwich'in Social and Cultural Institute

Permit No.: 2009-017	**Class**: 2
Region(s): GW	**Location**: Two gravel pits along the Dempster Highway aproximaterly 40 - 60 km west of Fort McPherson.

Archaeological assessment of gravel developments at KM 36.7 and KM 24, Dempster Highway

The Gwich'in Social & Cultural Institute was contracted by the Department of Transportation to conduct a post-impact assessment of geotechnical testing and an archaeological impact assessment of a gravel pit expansion project on the Dempster Highway. The gravel pit is located at Kilometre 36.7 (i.e. from the Yukon Border), on the north side of the highway. It was identified as having an increased potential for buried archaeological remains, due to proximity to traditional trails and landforms.

The work was carried out by a contractor on 4 June 2009. The gravel pit is located in the Bonnet Plume Flats region and is within the traditional territory of the Teetł'it Gwich'in of Fort McPherson. The Teetł'it Gwich'in travel through this area to and from the mountains hunting the Porcupine caribou herd and Dall sheep, and when travelling to other communities. Traditionally, the Teetł'it Gwich'in would move to the mountains for caribou hunting in the winter, spring, and fall, and return to the Peel River and its tributaries for fishing in the summers. The proposed gravel pit is located within Ddhah Deechan, a Gwich'in place name referring to the foothills of the Richardson Mountains.

The intact portions of the proposed expansion were surveyed completely by foot. Eighteen shovel tests were excavated. Approximately 100 disturbances were examined for cultural materials. Natural and cat-trail surface exposures were numerous. No cultural remains were discovered, and no impacts to archaeological materials are anticipated from the development of this gravel pit.

Bussey, Jean
Points West Heritage Consulting Ltd

Permit No.: 2009-004	**Class**: 2
Region(s): NS	**Location**: A Linear Corridor running between Tibbitt and Pellatt
Lakes	

Tibbitt to Contwoyto winter road project

In 2009, archaeological investigations were conducted for the Joint Venture (JV) that operates the Tibbitt to Contwoyto Winter Road. The 2009 investigations were limited to a two-day inspection tour of the existing winter road south of Lac de Gras. This is the fifth year that Points West has been part of the annual winter road inspection tour, which also included a JV representative, an EBA biologist, and a representative of the Yellowknives Dene First Nation.

The Tibbitt to Contwoyto winter road runs from the south end of Tibbitt Lake, near Yellowknife, to almost the north end of Contwoyto Lake, in Nunavut, and has been utilized in most winters for more than 25 years. In the winter of 2008 to 2009, the ice road was not constructed north of Lac de Gras, because of a lack of mining activity. In previous years, a number of archaeological sites located near the winter road or its associated developments (gravel pits and camps) were marked by stakes to ensure avoidance during winter activities. Monitoring of the protected archaeological sites south of Lac de Gras was the major component of the 2009 archaeological investigations.

Four of the seven protected sites are near portages along the winter road; one is near the boundary of a camp and two are near active gravel pits. Damaged stakes were replaced, when necessary, and the top of all markers were sprayed with fluorescent paint to make them more visible in winter. It was discovered that more markers were required at KjPa-1 near Lockhart Lake Camp, as a result of the storage of snow removal equipment near the eastern boundary of the lease. Additional markers were added by the inspection crew. Additional markers were also placed at two gravel pits (GP8 and GP9), to better define the area within which borrowing may occur; these markers are at least 30 m from known adjacent sites. The remaining protected sites are intact and no further actions were required.

Clarke, Grant
Golder Associates Ltd.

Permit No.: 2009-005
Class: 2
Region(s): IN
Location: 107C, Mackenzie Delta south of Tuktoyaktuk

Proposed Tuktoyaktuk to Source 177 access road

In June and July 2009, IMG-Golder Corporation (IMG-Golder) conducted an archaeological survey on behalf of the GNWT Department of Transportation for the all weather access road between the community of Tuktoyaktuk and a gravel source referred to as 'Source 177'. The road extends south of the hamlet to Source 177, located on Inuvialuit-owned lands.

The access road right-of-way is approximately 22 Km in length and is situated in rolling topography. The proposed route crosses several small streams and is located adjacent to several small to mid-sized lakes. The overall potential for heritage resources is considered to be moderate to high for parts of the right-of-way.

Approximately 1/3 of the right-of-way was assessed as part of this field investigation. Construction of the road base was initiated on most of the northern 2/3 of the right-of-way precluding an appropriate inspection of the pre-construction environment. A total of 15 shovel tests were excavated during the course of this assessment. No surficial or subsurface cultural materials were identified as a result of the field investigations.

The assessment included a low level helicopter reconnaissance of the entire length of the right-of-way, in conjunction with pedestrian survey with shovel testing in areas of highest archaeological potential. Shovel testing was completed to identify areas of deposition and possible buried sites. No heritage resources were identified or revisited as a result of this investigation.

Dueck, Lori
Parks Canada

Permit No.: 2009-008 **Class**: 2
Region(s): SS **Location**: Canoe Lake area, 96P

Sahtu Dene extension survey, Tuktut Nogait National Park of Canada

On June 26, the four members of the archaeological survey team met in Paulatuk to begin two weeks of fieldwork within the Sahtu Dene Extension of Tuktut Nogait National Park (TNNP). This area had not been previously surveyed for archaeological sites or vegetative studies. Fog rolled in and hung over Paulatuk, delaying our departure by five days. On July 2, the fog cleared and we departed for the park, landing on an unnamed open lake located 3km from the frozen Canoe Lake.

We had to redefine our objectives, due to the five days cut short from our two week field season. We agreed to complete the survey around Canoe Lake, the plateaus to the west and north of the lake, and around a small unnamed lake at the east end of Canoe Lake. We recorded an intriguing archaeological feature, possibly identified as a drive line. Literature describes a drive line as a line of widely spaced rock cairns that limits the movement of caribou, forcing the herd to move in a direction towards a slope or cliff. The feature we recorded is a distinct alignment of evenly spaced clusters of rocks, extending approximately 500 meters across an expansive plateau.

We recorded 12 archaeological sites, consisting of several features, such as tent rings, blinds, stretching and drying platforms, caches, and numerous marker rocks. We recorded numerous marker rocks situated on tops of knolls, ridges, and along bank edges of plateaus. The markers were built low to the ground with two to fourteen rocks.

Gray, David
Grayhound Information Services

Permit No.: 2009-015 **Class**: 1
Region(s): IN **Location**: Northern Banks Island

Desperate Venture

The objectives for the Desperate Venture project are to research and document an illegal trapping expedition to Banks and Melville Islands in 1931-32 by Sandy Austin, a young HBC clerk from Scotland, and Naploeon Verville, a trapper from Edmonton. The project began in 2007 and the initial archives research and travel was completed in 2007-2008.

In July 2009, I travelled to Sachs Harbour and northern Banks Island for two weeks. I stayed at the Parks Canada Polar Bear cabin in Aulavik for four days (July 14 to 17). I was able to search by helicopter for the cache left by Austin and Verville at Cape McClure in mid October 1931. On July 15, with three observers, we searched 40 km of the northern coast from Antler Cove to Cape Wrottesley, flying back and forth several times, right at the coastline as well as inland along suitable ridges and beaches. Unfortunately, no trace of the cache was found. Geologists working in the area have calculated a shoreline retreat of about one meter every two years. Thus it seems that any cache left at the coastline in 1931 would have been washed into the ocean years ago.

In Sachs Harbour, I was given two items from the Cora schooner that were brought back about ten years ago; a metre-long piece of the brass propeller shaft and a 21x25 cm brass porthole. The propeller shaft was sent directly to the Prince of Wales Northern Heritage Centre and the porthole will be donated to the museum following consultation with the Verville and Austin families.

Hartery, Latonia
University of Calgary/Telltale Inc.

Permit No.: 2009-022
Region(s): IN
Class: 1
Location: Vicinity of Banks and Victoria Islands and a few points on the Northern coastline of the NWT

Out of the Northwest Passage cruise

From September 1-16, 2009, the Adventure Canada cruise ship sailed from Cambridge Bay towards the Beaufort Sea and retraced its sailing south of Banks and Victoria Island. From here, the ship headed northward to Beechey Island, en route to Pond Inlet and Greenland. During the ship's journey, several archaeological sites were visited in the Northwest Territories and Nunavut. Only one stop in the Northwest Territories revealed evidence of archaeological remains.

Cape Baring on southern Victoria Island constituted the only stop our cruise vessel made in this territory that yielded archaeological remains. At this location, two meat caches and what is possibly a tent ring were observed. The tent ring was roughly 4.5 metres in diameter. In general, the tent structure could be described as "barely there" and it was difficult to distinguish from the limestone beach in general, since the rocks comprising the feature were very small. The tent ring lies about 8m from the meat caches. An axial structure seems to bisect the house, but given the nature of the beach and its constant exposure to freeze-thaw action, it was difficult to determine what features of the structure, especially its depression, were natural or imposed. The feature seems very recent, however, and therefore unlikely to be Paleoeskimo. Both meat caches were about 2-3 meters across and had a height of approximately 40cm. It is presumed that the current dimensions are shorter and wider than its original construction, since the cache had been disassembled. Both were comprised of extremely large boulders. Historic maps and documents of the De Salis Bay area show Thule houses to the east and west of the bay, but none were recorded at our landing spot.

Lobb, Murray
AMEC Earth and Environmental

Permit No.: 2009-021
Region(s): NS
Class: 2
Location: 50 Km NE of Yellowknife, Between Parr and Little Sproule Lakes

Old Parr and Liten mine phase II/III environmental assessment

In August 2009, a field crew visited the historic mine site of Old Parr / Liten as part of an environmental impact assessment (EIA). The mine site is located 45 km northeast of Yellowknife, between Sproule and Parr Lakes. Part of this EIA included an Archaeological Impact Assessment (AIA).

The Old Parr/Liten Mine was staked in 1947 by Louis Garskie. Louie came to the north during the great depression, with Harry Weaver of Peace River. In 1947, Garskie examined federal government geological survey pamphlets, which suggested gold may be present in the Parr Lake area. Garskie and Martin Bode of Yellowknife mined the site by themselves, optioning the claim twice, during which exploratory diamond drilling was conducted. In 1964, the mine was optioned to Liten Mining Company Limited of Edmonton, AB, who upgraded the operation. Liten pulled out of the mine site in 1965, and Garskie worked by himself until 1972, and then again in 1974.

Fieldwork commenced on August 17th of 2009. During this fieldwork, the mine pits, mill site, and Garskie's cabin were surveyed, and all exposed bedrock surfaces were examined for prehistoric materials, such as stone and bone tools, debris from making stone tools, fire cracked rock, and bone from animals. No prehistoric sites were found, but the mine site was recorded in what is believed to be in its entirety. The mine site was recorded using field notes, digital photography, and differential GPS. All structures and foundations found still standing on the mine site were mapped and sketched, with their dimensions recorded and method of manufacture noted. Photographs were taken of all the structures and foundations present at the mine site from multiple angles. Photos were also taken of artefacts found in and around the mining buildings and infrastructure.

MacKay, Glen
Prince of Wales Northern Heritage Centre

Permit No.: 2009-009
Class: 2
Region(s): DC
Location: Trout Lake, 95A

Sambaa K'e archaeology project

This project is an archaeological survey of the traditional land use area of the Sambaa K'e got'ine (Trout Lake People) . A collaborative effort between Elders, students and archaeologists, the Sambaa K'e Archaeology Project involves visiting important cultural places identified by the elders of the Sambaa K'e Dene Band, and documenting them as archaeological sites. The project has a strong educational component for high school students from the community, with students receiving instruction in archaeological survey methods and learning about important cultural places from community elders.

We recorded four new archaeological sites during this brief project, including a cabin and a trail located to the southwest of Sambaa K'e near Tóochoo ("big water", also known as Celibeta Lake), a precontact lithic scatter, and a historic camping location. We also conducted test excavations at a previously recorded precontact archaeological site.

MacKay, Glen
Prince of Wales Northern Heritage Centre

Permit No.: 2009-016
Class: 2
Region(s): SS, NS
Location: Taltheilei Narrows, East Arm Great Slave Lake

Kaldele archaeology project

The goal of the Kaldele archaeology project was to map and characterize historic features at two log house villages in the vicinity of Kaldele, or Taltheilei Narrows. This work was carried out in the context of a larger project organized by the Łustelk'e Dene First Nation (LKDFN) to assess the heritage and interpretive values of Kaldele and document oral history related to the village sites.

The two villages at Kaldele, located on either side of the narrows, were occupied in the first half of the 20th century. The older village contains five partially collapsed cabin features, as well as additional structures, such as a dog yard, outhouse, etc. The remains of four cabins and associated structures mark the location of the newer village. Our assessment of the Kaldele village sites, conducted in collaboration with the LKDFN, included detailed mapping of all of the village features, recording of the architectural details of the log buildings on standardized recording forms and photo-documentation of all structures and associated features. In addition, the LKDFN conducted detailed interviews with elders that lived at these villages in the historic period. In total, this project resulted in the recording of five new archaeological sites. In addition to the two historic village sites, we also recorded two lithic scatters and a tent ring.

Murphy, Brent
Golder Associates Ltd.

Permit No.: 2009-003
Class: 2
Region(s): NS
Location: Hislop Lake area, 85N

Fortune Minerals Limited, proposed Nico Mine and access road

The NICO Project is a mine proposed in the Wek'eezhii Settlement Area, approximately 50 km northeast of Whati and 10 km northeast of Hislop Lake. Previous studies that have been completed on behalf of Fortune Minerals Ltd. for their NICO Project include an Heritage Resources Impact Assessment (HRIA) for their bulk sampling program for an underground gold mine operation and for a proposed all weather road.

The purpose of the current HRIA was to assess areas that were not included in the previous studies, including changes to the mine site footprint and borrow sources for the all weather road. The HRIA was concentrated on the seven identified borrow sources for the proposed all weather road, changes to the road and changes to the mine footprint including a proposed runway. The survey included aerial survey of all areas, and pedestrian surveys and shovel testing of areas that were considered to exhibit moderate to high potential for heritage resources. These included river and creek crossing, uplands, ridges and elevated areas adjacent to water bodies. In total approximately 520 shovel tests were excavated in the study area and two previously recorded sites were revisited. No artifacts were recovered from these tests.

Prager, Gabriella
Points West Heritage Consulting Ltd.

Permit No.: 2009-023
Class: 2
Region(s): DC
Location: South Mackenzie Mountains

Prairie Creek Mine winter access road

In September 2009, an archaeological assessment of selected portions of a proposed winter road between Nahanni Butte and the Prairie Creek mine was completed. There were three sections of possible heritage concern that had been identified during a Nahanni Butte Dene traditional knowledge study. The easternmost feature of interest is a pass known as Second or Grainger Gap. The next pass of concern to the west is called Wolverine or Silent Hills Pass. The westernmost area of the three identified is the crossing of the Tetcela River.

The initial step of the study was for the archaeologist to meet with Band members who were knowledgeable about the past uses of these particular areas. The members who were available confirmed the importance of Second Gap as a use area for Nahanni Butte people for a considerable length of time. However, they had no specific knowledge of the use of either Wolverine Pass or the Tetcela River.

We proceeded to fly over the areas of interest, as well as the sections of the route between. Ground reconnaissance was completed for the entire length of the Second Gap pass and both banks of the main Tetcela River crossing. A brief stop was made at the second Tetcela crossing for visual assessment. The Wolverine Pass area was visually assessed from the helicopter by repeated low and slow passes and circles. Shovel testing was conducted on both sides of the river crossing as well as along a well defined terrace in Second Gap, in the vicinity of some camp remains. All shovel tests were negative and visual surface inspection revealed no archaeological remains. The camp contained remains of a tent frame, some cut brush, a pail, and a circle of rocks likely representing a hearth. The site probably dates no earlier than the cut line(the 1980s). Therefore, it was not recorded as an archaeological site. No other cultural remains were observed.

Prager, Gabriella
Points West Heritage Consulting Ltd.

Permit No.: 2009-024 **Class**: 1
Region(s): IN **Location**: Mackenzie Delta

Tuktoyaktuk to Inuvik road

An overview assessment of a corridor for a proposed 140km long all season road between Inuvik and Tuktoyaktuk was conducted in September 2009. Included in the assessment were a number of possible borrow sources and several alternative segments of road.

The archaeological overview assessment of the proposed road route and selected borrow sources had two goals: to assess terrain to be affected by this project in order to rate archaeological potential, and to determine if any previously recorded sites are located in the immediate vicinity of the proposed developments.

The primary method used to rate potential for archaeological resources was visual assessment by low and slow helicopter overflight, following the proposed alignment using GPS coordinates and topographic maps. Some of the possible gravel sources were also overflown, with the boundaries roughly approximated using topographic maps. Coordinates of previously recorded sites were compared to the locations of project components. Segments of the road routes and borrow sources were rated to have low, moderate or high archaeological potential and were plotted on the topographic maps. Terrain features that are high and dry, such as knolls and ridges, are rated as having good potential for archaeological resources. When such features are adjacent to large lakes or streams, particularly at confluences, the archaeological potential is rated as high.

No previously recorded archaeological sites were found within the proposed road corridor, but 12 sites are in close proximity. One site along Husky Lakes is within or near a proposed gravel source and 3 or 4 others may be in other proposed borrows. The data gathered during the overview assessment will be used to determine the specific portions of project components that will require ground reconnaissance surveys during the next phase of study, and to identify where realignment or relocation of project component boundaries may serve to avoid sites.

Youell, Alan
FMA Heritage Resources Consultants Inc.

Permit No.: 2009-002 **Class**: 2
Region(s): IN **Location**: Ellice Island, Mackenzie Delta, 107C

MGM Energy Corp. 2009 summer field program
Archaeological investigations for three proposed drilling locations (150 metre X 150 metre well pads) and two access road routes, as well as a post-impact assessment of the Southeast Ellice (J-27) access route were conducted. This investigation is part of a larger program of biophysical study designed to assess potential future development locations. The specific purpose of the archaeological component was to identify archaeological, historical and traditional land use sites at the proposed drilling and access route locations.

Field reconnaissance consisted of a helicopter overflight, pedestrian traverse, surface examination and shovel testing to determine the presence of unrecorded archaeological or cultural sites. Shovel tests were excavated at the three proposed drilling locations.

All potential new developments are located adjacent to the East Channel of the Mackenzie River, in the North Caribou Hills region. Two of the proposed drilling locations, Ogruknang B-27 and Ogruknang B-28, are located on a relatively active alluvial plain, associated with the East Channel of the Mackenzie River, and are subject to seasonal flooding. Continuous remodelling of the areas, combined with shallow sediments and underlying waterlogged and silty clays, contributed to an assessment of these locations having low potential for the identification of archaeological or cultural sites. The other proposed drilling location, Ogruknang M-57, is located on a gently sloping hummocky upland area of the North Caribou Hills. This area is also relatively poorly drained with sediments consisting of moist clays intermixed with sparse gravel resulting in an assessment of this location as having low potential for the identification of archaeological or cultural sites. The two access routes were found to be located in drainage gullies associated with the North Caribou Hills, supporting a seasonally dynamic stream environment. This environment resulted in an evaluation of low potential for the identification of archaeological or cultural sites. Surface inspection and shovel testing of the development footprints did not identify any archaeological, historic or traditional land use sites.

Bill, Kevin

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Permit No: S-09/10-4014-IN **Fish Species Studied:** Broad Whitefish, Lake Trout
Region: IN

Fisheries assessment of Big Lake (Ilkaasuat) and Dolomite (Airport) Lake

1. Gather baseline information on species present in the Dolomite (Airport) Lake and Big Lake, NT.
2. Estimate density and abundance of lake trout in the systems.
3. Collect other biological and environmental data in the systems.

Blais, Jules

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Jules.Blais@uottawa.ca

Permit No: S-09/10-4010-IN **Fish Species Studied:** All Species (excludes marine mammals)
Region: IN

Examining the impacts of climate change on aquatic and terrestrial ecosystems of the Mackenzie Region, NWT

To examine the impacts of climate and environmental change on freshwater ecosystems, particularly the accumulation of mercury and other environmental contaminants in fish. We will specifically sample lakes that have thaw slumps in their drainages and compare these with lakes that do not have thaw slumps to examine the effect of thawing permafrost on contaminants in fish.

Cobb, Donald

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Permit No: S-09/10-4008-IN **Fish Species Studied:** Benthos
Region: IN

Northern coastal marine studies program

The fundamental objective of this program is to address DFO's responsiblity to ensure that relevant science is conducted, in order to provide scientifically defensible advice in support of regulatory decisions regarding the protection of fish and fish habitat. The integration of sea-bed mapping and physical and biological sampling is intended to provide a comprehensive picture of the status and composition of the coastal Beaufort Sea ecosystem. The central objective of the fishing component of this program was to provide data regarding the presence of fish, in support of an on-going multibeam mapping program of the Beaufort Sea floor, and to contribute to the general biological and ecological information on offshore pelagic and benthic fish populations.

Secondary objectives were to:

1. ground-truth data from the hydro-acoustic surveys of the biota on the sea floor and in the water column;
2. provide samples for an ongoing study of the trophic structure of Beaufort fish populations; and
3. provide samples for ongoing genetic (stock structure and variability) and contaminant studies of fishes in this area.

Cote, Jason

Cambridge Gordon
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JCote@cambriagordon.com

Permit No: S-09/10-3002-YK **Fish Species Studied:** Lake whitefish
Region: SS

Deze Energy Corporation Ltd. Taltson expansion project - 2009 fisheries field program

The Taltson hydroelectric expansion project proposes to add a 36MW power plant at the existing 18MW Taltson Twin Gorges Plant and a new 600 km powerline. The proponent is in the process of conducting an environmental impact assessment and preparing a developers assessment report (DAR). In order to complete the DAR, a field work program was required to determine the potential impacts to fish, to evaluate the magnitude of such impacts, and to determine the long-term residual effects, if any, on the environment.

This field program identified potential spawning and rearing sites for these species, followed by visits to potential spawning sites to determine if spawning habitat was present. Bathymetric surveys were conducted at these sites in order to determine the areal extent of potential habitat loss, and the quality of habitat that will be affected. This will allow for a better assessment of the impacts of water drawdown in Nonacho Lake on key fish species.

Cote, Jason

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Permit No: S-09/10-3014-YK **Fish Species Studied:** Lake Whitefish
Region: SS

Deze Energy Corporation Ltd. Lutsel K'e hydro power project - 2009 fisheries field program

The obejctives of this program were to:

1. conduct a fish and fish habitat assessment upstream and downstream of the proposed project site; and
2. determine if the first rapids on the Snowdrift River act as a fish barrier.

Cott, Peter

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Permit No: S-09/10-3000-YK
S-09/10-3000-YK-A1
S-09/10-3000-YK-A2
Region: SS, NS

Fish Species Studied: Deepwater Sculpin, Lake Whitefish, Burbot

Ecology of a northern boreal fish, the burbot: implications for northern development

Objective 1: To identify the role of burbot in the structure of boreal lake ecosystems.

a) Using a stable isotope approach, the trophic position and dynamics of lacustrine burbot in relation to other sympatric species in northern food webs was determined.

b) The spatial variability of the trophic position of burbot was compared among lakes, and between northern and southern populations within their Canadian range.

c) The trophic position of, and energy flow to, burbot was compared with that for other sympatric apex predators.

Fish Collection:

Fish were captured to provide information on fish size, biomass, and community structure. Due to the difficulty of capturing burbot in gillnets, burbot were sampled using baited long lines in a randomized and standardized way to get catch-per-unit-effort (CPUE) for relative abundance estimates. These estimates were used to compare burbot populations among lakes, and the ratio of burbot to other fishes were used to compare among lakes.

Objective 2: To define the reproductive parameters of burbot, determine the drivers of reproductive effort among individuals, and compare reproductive strategies between northern and southern lakes.

Burbot Collection:

Burbot were collected in the winter using longlines set under the ice with the aid of jigger boards. Each hook was baited, and the number of hooks set and set times were recorded to calculate CPUE. Burbot were sampled between late January and early March to collect fish before, during, and after spawning. Approximately 30 burbot were collected from each waterbody at each sampling effort. All burbot were processed in the lab to obtain the following information: total length, body weight, sex, sexual maturity, gonad weight , liver weight , stomach contents, presence of swim bladder musculature, and gutted body weight.

English, Colleen

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Permit No: S-09/10-3016-YK
Region: NS

Fish Species Studied: Longnose Sucker, Lake Trout

Diavik fish palatability study

The objective of this study was to catch fish in Lac de Gras for tasting by local aboriginal people, to determine texture and taste of fish in a lake receiving mine effluent. Also, to obtain aging structures and tissue samples for mercury analysis, and to contribute to the knowledge base of mercury concentration ratios in the local trout population. Levels of both were monitored to see if they are increasing over time.

Evans, Marlene

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Permit No: S-09/10-3017-YK **Fish Species Studied:** Burbot
Region: SS

Spatial and long-term trends in persistent organic contaminants and metals in fish from the Northwest Territories
The objective of this work was to investigate whether contaminant levels are changing in fish in the Northwest Territories, with a focus on Great Slave Lake, Colville Lake, and Great Bear Lake.

Fortier, Martin

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Permit No: S-09/10-4013-IN **Fish Species Studied:** Marine fish (Pelagic)
Region: IN

ArcticNet 2009 expedition: integrated regional impact study of the coastal Western Canadian Arctic
The Arctic Ocean and its peripheral seas have experienced unprecedented change over the past 15 to 20 years. These changes are associated with climate variability and change. In particular, sea ice is now observed to form later, break-up earlier, and at its minimum to cover a progressively smaller area of the Arctic Ocean. Our understanding of the impacts of these changes on the physical, biological and geochemical processes in the Canadian Arctic Ocean is progressing, but still wanting.

Since 2004, ArcticNet researchers have been conducting extensive multidisciplinary sampling programs in the Beaufort Sea/Mackenzie Shelf/Amundsen Gulf region. The goal of the ArcticNet marine-based research program is to study, on a long-term basis, how climate induced changes are impacting the marine ecosystem, contaminant transport, biogeochemical fluxes, and exchange processes across the ocean-sea ice-atmosphere interface in the Canadian Arctic Ocean. Ultimately, the knowledge generated from this multi-year program will be integrated into regional impact assessments to help decision makers develop effective adaptation strategies for the changing coastal Canadian Arctic.

Frame, Stacey

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Permit No: S-09/10-2004-HR **Fish Species Studied:** Sucker (spp), Inconnu
S-09/10-2004-HR-A1
Region: SS

Great Slave Lake inconnu study - 2009

The objective of this work is to conduct stratified random sampling using gillnets, to determine the presence and abundance of inconnu in east Great Slave Lake.

Frame, Stacey

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Permit No: S-09/10-2005-HR **Fish Species Studied:** Inconnu
Region: NS, DC

Buffalo Lake inconnu collection
Twenty inconnu from the Yates and White Sands Rivers were collected for biological sampling. Information gathered was used for stock identification purposes and the management of Great Slave Lake inconnu.

Gallagher, Colin

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Permit No: S-09/10-4016-IN **Fish Species Studied:** Dolly Varden (Landlocked)
Region: IN

Pre-stock assessment study of the Vittrekwa River, NT
The objectives of the streamside survey were to compliment the data collected by the Gwich'in Renewable Resources Board in 2006 and 2007 in order to:

1. locate and confirm spawning areas;
2. measure habitat characteristics (e.g. stream width);
3. enumerate fish from shore;
4. seine/angle in certain locations to capture fish to measure length and weight and determine sex/maturity; and
5. compare with previous results.

Hamilton, David

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Permit No: S-09/10-3005-YK **Fish Species Studied:** Lake chub
Region: SS

Canadian Zinc Corporation (CZN) fish habitat compensation program (Prairie Creek, Northwest Territories)
No research was conducted under this permit.

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Permit No: S-09/10-3006-YK
S-09/10-3006-YK-A1
S-09/10-3006-YK-A2
S-09/10-3006-YK-A3
Region: SS

Fish Species Studied: Mountain Whitefish

Canadian Zinc Corporation - habitat compensation investigation

Study the effects of road realignment for Prairie Creek Mine. Conduct habitat assessments and sample fish data, including species and length.

Harwood, Lois

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Permit No: S-09/10-4004-IN
Region: IN

Fish Species Studied: Bearded Seal, Ringed Seal

Assessment of reproduction, condition, disease and contaminants of ringed seals and bearded seals through harvest-based monitoring at Ulukhaktok, NT, 2009

The objectives of this study are listed below.

1. In community-based programs, ringed seals taken in the annual harvest in the Ulukhaktok area (sample size of 100) were sampled and measured using reproductive status and body condition as indicators of ecosystem productivity and fluctuations in the seal population.
2. Aspects in objective 1 were examined in the context of regional ice conditions.
3. Samples were provided for "stock health" related studies, such as disease and contaminants.
4. In community-based programs, sample and measure any bearded seals that happen to be taken in the annual harvest in the Ulukhaktok area (sample size of 5), to examine reproductive rates, growth, condition and prey preferences.

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Permit No: S-09/10-4005-IN
S-09/10-4005-IN-A1
Region: IN

Fish Species Studied: Bowhead Whale

Bowhead whale tagging – Beaufort Sea 2009

Bowhead whales of the western Arctic population come to the Beaufort Sea each summer to feed, and form large loose aggregations in the offshore Beaufort from approximately mid-August to late September. The aggregations form in traditional areas, where oceanographic conditions favour the concentration of zooplankton, their main prey item. Not all aggregation areas are attractive to bowheads in all years, due to varying oceanographic conditions.

Some of these feeding aggregation areas are located in offshore waters, which have been subject to seismic exploration activity in the 1980s and in 2006-2008, and for which extensive seismic projects are planned for 2009 and 2010. In addition, on their return fall migration to the Bering Sea, this same stock is also subject to extensive shipping and seismic activities in the Alaskan Beaufort and Chukchi seas. Disturbance of whales from underwater noise emanating from ships, barges, aircraft, seismic operations, scientific operations or other sources, can elicit avoidance responses in the whales. The information gained through this study is essential for the assessment of potential impacts of offshore development on bowhead whales in the SE Beaufort Sea, and for regulation of such activities.

1. Aerial surveys in August 2007, 2008 and 2009 were conducted to provide real-time regional information on the distribution of bowhead whales at the time of the seismic survey and tagging, which will be available for mitigation plans and actions.
2. The satellite tagging of bowhead whales provided a view as to how the whales use the feeding aggregation areas, their residence times, and possible reactions to seismic operations.
3. Finally, results were used to compare bowhead distributions between years (2007, 2008, 2009) with their distribution in the past (1980-1986).

Hawkins, Jim

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Permit No: S-09/10-4006-IN **Fish Species Studied:** Saffron Cod
Region: IN

Ajurak 2009 field data collection program

Imperial conducted a field data collection program in 2009 on, and near, Exploration Licence 446 (Ajurak) in the Canadian sector of the Beaufort Sea. The objective of this program was to extend the understanding of the physical and chemical oceanographic conditions in:

1. the Beaufort Shelf, shelf break and Ajurak (EL 446);
2. the plume front of the Mackenzie River; and
3. several coastal harbour areas, including Tuktoyaktuk Harbour.

Imperial requires the field data for its proposed exploration drilling program, specifically to:

1. advance the engineering design of the exploration well;
2. develop safe and environmentally responsible drilling operations and support;
3. provide additional environmental data to support the environmental impact assessment for exploration drilling.

This program adds to the existing engineering and environmental data for the Beaufort Sea.

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Permit No: S-09/10-2000-HR
S-09/10-2000-HR-A1
S-09/10-2000-HR-A2
Region: SS

Fish Species Studied: Benthic Invertebrates, Bull trout, slimy sculpin

Aquatic environmental effects monitoring - Flat River at Cantung Mine

To determine the length, weight, and general condition of 100 fish (Slimy Scuplin -*Cottus cognatus*) per site at three site locations in the Flat River: one location upstream of the CanTung mine site, and at two locations downstream from the mine site. Also, to determine sediment and water quality (nutrients and metals) as well as benthic invertebrate abundance and taxonomic composition at the same sites. Statistical methods were used to determine whether differences between sample sites (exposure and control) are of statistical significance.

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Permit No: S-09/10-2003-HR
Region: SA

Fish Species Studied: Lake Trout

Monitoring of lake trout stocks in Great Bear Lake (Sahtu)

Stock assessment studies in Great Bear Lake (Sahtu) over the past few years have provided baseline biological information for lake trout populations in the Keith (Dareli) Arm area, and updates on trout populations in other arms of Great Bear Lake (Sahtu), which had not been assessed in the last 20 years. The information from these studies provides an excellent base from which to continue long-term monitoring for changes to trout stocks, that may result from changes in fishing policies or harvest levels, habitat and climate change, and industrial activities. The proposed study followed up on the baseline biological studies with the objective of continued monitoring of biological characteristics of trout populations over the long term to keep track of changes that may occur with changing harvest levels and/or the environment. Populations will be sampled for biological information, such as size, age, sex, maturity and fecundity, once every 5 years on a rotating basis, using similar methods as in previous assessment studies. Because there are too many populations to sample all at one time, sampling is carried out in one arm of the lake per year. The same location will then be revisited in 5 years time. We completed the second year of this rotation in summer 2008, with an assessment of the McVicar (Turili) Arm area. We propose to conduct an assessment in the McTavish (Kwit tla) Arm area in the summer of 2009.

Howland, Kimberly

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Permit No: S-09/10-3012-YK **Fish Species Studied:** Lake Trout, Benthic Invertebrates
Region: SA

Monitoring of lake trout stocks in Great Bear Lake (Sahtu)
The objectives of this work were to:

1. determine the extent of movements by lake trout in Great Bear Lake using molecular genetics,
2. monitor size and age structure, fecundity, growth and mortality of lake trout populations in Great Bear Lake; and
3. monitor species composition of by-catch and invertebrate species.

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Permit No: S-09/10-3013-YK **Fish Species Studied:** Cisco
Region: SA

Cisco diversity in Great Bear Lake, Northwest Territories
The objectives of this work were to:

1. examine the morphological, meristic and life history characteristics of arctic cisco;
2. conduct target sampling and examination of characteristics of cisco from deeper regions of Great Bear Lake to increase sample size and range of surveyed habitat;
3. compare Great Bear Lake with shortjaw cisco to verify species identification.

Howland, Kimberly

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Permit No: S-09/10-4007-IN **Fish Species Studied:** Arctic Charr (Searun)
Region: IN

Charr monitoring at Hornaday River, NT
The objectives of this work were to:
1) maintain the charr monitoring project and continue to provide information on status and life history of the charr stock; and
2) continue to provide important support information for the formulation, delivery and compliance of the Paulatuk Charr Management Plan.

Howland, Kimberly

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Permit No: S-09/10-4009-IN **Fish Species Studied:** Dolly Varden
Region: IN

Population assessment of Big Fish River Dolly Varden

The objectives of this study were to:

1. conduct tagging of Dolly Varden in the Big Fish River, to provide an up to date population estimate using mark recapture techniques and an up to date estimate of the percent contribution to the Shingle Point Harvest;
2. complement the tagging study with a streamside survey;
3. obtain up to date information on biological characteristics (size, maturity, sex ratio) using live sampling methods, to determine stock health;
4. collect fin clips for genetic analysis, to contribute to research on stock delineation; and
5. test the use of the DIDSON sonar to enumerate dolly varden in the Big Fish River, and assess its application in other rivers along the North Slope.

Howland, Kimberly

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Permit No: S-09/10-4011-IN **Fish Species Studied:** Dolly Varden
Region: GW

Rat River Dolly Varden mark-recapture program

The objectives of this work were to:

1. obtain an estimate of population size of Dolly Varden charr in the system;
2. enhance and utilize existing expertise in the community in the collection of biological data, and to assist with the delivery of the biological program.

Howland, Kimberly

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Permit No: S-09/10-4015-IN **Fish Species Studied:** Dolly varden (searun)
S-09/10-4015-IN-A1
Region: GW

Population assessment of Dolly Varden in the Rat River 2009-2010

To obtain a long-term record of Dolly Varden catches at the various traditional fishing locations, where the Rat River stock is caught. This serves as a check on the harvest study information, and increases the profile of management initiatives and concerns in regard to this fishery.

To monitor the number, size, sex, age and maturity of Rat River Dolly Varden taken at each of three harvest locations. This information provides a measure of the stock status and health.

To facilitate return of fish tags recovered in the Rat River subsistence fisheries.

To enhance and utilize existing expertise in the community in the collection of biological data, and to assist with the delivery of the biological program.

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Permit No: S-09/10-3015-YK **Fish Species Studied:** Zooplankton
Region: NS

2009 Fortune Minerals baseline program
To collect baseline data in support of an environmental assessment of the Fortune Minerals development.

Krizan, Julia

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Permit No: S-09/10-4000-IN **Fish Species Studied:** All species
Region: IN

Archaeological assessment and an assessment of fisheries potential of the Tuktoyaktuk to Source 177 all-weather road impact area
The purpose of the assessment of fisheries potential, including reconnaissance work, is to:

- provide baseline data for potential fisheries resources in the impact area;
- identify potential impacts to these resources;
- produce terms of reference for possible further fish-related studies; and
- develop preliminary mitigation measures for fisheries resources (if required).

This work was completed by compiling and analyzing existing literature and documentation for known fish species and fish habitats in the area, so that areas with higher potential for fisheries resources could be identified. A field assessment of four to five of the eight stream crossings along the road route were conducted. This included assessing stream habitats to provide information on migration, spawning and juvenile rearing areas, characterizing streams (e.g. channel widths, water velocity, sediment bed materials, water salinity), and characterizing shorelines (e.g. substrate type, vegetation, gradient). Electro-fishing was conducted at some of those streams for the accurate identification of specific fish species / fish communities present in the waters. All fish handled were released live back into their original habitats, with no fish mortality.

Field work was conducted over the course of two 12-hour days. A field team, including one senior fish habitat biologist, one field technician, one wildlife monitor (Inuvik and / or Tuktoyaktuk HTC) and one senior archaeologist (for other archaeology research), were flown daily out of Inuvik in a helicopter. The field team landed near previously identified potential fisheries resources at chosen stream crossings for detailed investigations.

Landry, Francois

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Permit No: S-09/10-3004-YK **Fish Species Studied:** Arctic Grayling
Region: NS

EKATI Diamond Mine - fish monitoring program 2009

Fish entering the Panda Diversion Channel (PDC), Pigeon Stream and Pigeon-Fay Stream, in the spring, were sampled with box traps. Arctic grayling spawners were tagged, in order to follow their movements in and out of the watercourses. Visual surveys of arctic grayling spawners were conducted on nearby streams, including: Pigeon-Fay Stream, Pigeon Stream, Polar-Vulture Stream, Airport Stream, Kodiak-Little Stream, Buster Stream and Grizzly Stream.

In Nero-Nema Stream, arctic grayling spawners, as well as newly-emerged arctic grayling fry, were sampled to assess the fish population. Nero-Nema stream was sampled at low intensity as follows: (1) arctic grayling spawners and newly-emerged fry were counted by walking surveys; and (2) densities and size-at-date of arctic grayling fry were measured with dipnets and backpack electrofishers.

In Upper Exeter Lake (including Fay Bay) and Ursula Lake and its tributaries, the fish community was sampled to determine fish species presence. Gillnets, minnow traps and electrofishing were used for this presence/absence study.

The objective for each study was to sample fish with the minimum possible mortality. All fish were released live after counting, species identification, tagging (in PDC and Pigeon Stream only), collection of non-destructive aging structures (scales and fin clips) and measurement of body size. There was one exception to this; approximately 10 adult grayling from the PDC were sacrificed for fecundity information.

All fisheries work was conducted between May 20th and October 30th, 2009.

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Permit No: S-09/10-4002-IN **Fish Species Studied:** Longnose Sucker
Region: NS

EKATI fish monitoring

Rescan Environmental Services Ltd. (Rescan) was retained by BHP Billiton Diamonds Inc., the operator of the EKATI Diamond Mine, to monitor fish populations on the EKATI claim block during the open-water season of 2009. There were four programs that were in operation during the 2009 field season: (1) a post-2008 Panda Diversion Channel (PDC) Monitoring Program; (2) Nero-Nema Monitoring Program; (3) Upper Exeter Lake (including Fay Bay) Monitoring Program; and (4) Ursula Lake Monitoring Program.

Objectives of the studies that were conducted in 2009 included: (1) monitoring the use of stream habitat in the PDC by spawning fish, particularly arctic grayling; (2) comparing the biological characteristics of fish populations in the PDC with those in nearby reference streams; (3) monitoring the use of the stream habitat in Nero-Nema Stream (specifically evaluating the effectiveness of streambed modifications) by fish, particularly arctic grayling; and (4) sampling Upper Exeter Lake, and Ursula Lake and its tributaries, to determine species presence.

These projects were continuations of long-term monitoring programs at EKATI. The PDC, for example, has been monitored every year since 1998, although the specific sampling objectives have varied among years.

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Permit No: S-09/10-3019-YK
Region: NS

Fish Species Studied: Inconnu, Lake Chub

Baseline collection of Yellowknife Bay for precence or absence of Inconnu

The objectives of this work were to determine inconnu presence/absence in Yellowknife Bay of Great Slave Lake, and to obtain baseline data through capture and processing of multiple age classes.

Machtans, Hilary

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Permit No: S-09/10-3008-YK
S-09/10-3008-YK-A1
Region: NS

Fish Species Studied: All species

Miramar Con Mine environmental effects monitoring phase 3 study - investigation of cause

The objective of this work was to complete the third phase of the environmental effects monitoring (EEM) program at Con Mine under the metal mining and effluent regulations. Fish from locations exposed to mining effluent were compared to fish that were not exposed.

McCallum, Dee

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Permit No: S-09/10-3007-YK
S-09/10-3007-YK-A1
S-09/10-3007-YK-A2
S-09/10-2002-HR

Fish Species Studied: Plankton, Sculpins spp., Lake Trout, Lake Chub, Burbot, Benthos

Region: NS

De Beers Snap Lake Mine

Fish Health Study on Snap and Northeast Lake: The objective was to sample lake trout, lake chub and sculpin in both the reference and exposure areas of Snap Lake and Northeast Lake. Sampling was conducted shortly after ice-out in July, 2009.

Water Intake Biological Monitoring on Snap Lake: The objective was to demonstrate that 25 mm burbot (the target species and life stage) were not being impinged or entrained by the intake screen during its operation. Trawls were conducted in the area of the intake pipe for eight days during late spring and early summer.

Small Bodied Fish Monitoring at Embankments on Snap Lake: The objective was to use non-lethal fish community sampling to determine whether lake chub and slimy sculpin were present at newly constructed embankments during periods when spawning, nursery, foraging and rearing activities occurred.

Plankton Program on Snap and Northeast Lakes: This program collected information on the plankton communities in Snap Lake and Northeast Lake during the open water season. Profiles of water temperature, pH, dissolved oxygen and specific conductivity were also taken at each sampling site.

Post-construction Monitoring at Stream 27: Ecological data collected at this site included: fish species and number observed, habitat use by species and life stage, and adult fish length measurements.

Benthos Program on Snap and Northeast Lakes: Benthic invertebrate samples were collected under ice and during the open water season at 15 stations in Snap Lake and at 5 stations in Northeast Lake. Samples were used for taxonomic identification and enumeration of the benthic invertebrate community.

Fish Palatability Study on Snap Lake: Fish were netted or angled over a couple of hours, and then tested for palatability by individuals from local communities. Capture dates, times, locations, fish condition, weather and effort were recorded.

McPherson, Morag

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Permit No: S-09/10-3001-YK
S-09/10-3001-YK-A1

Fish Species Studied: Arctic Grayling

Region: NS

Baker Creek fish survey-reach 4

In 2006, portions of Baker Creek were rerouted and modifications were made to provide 2,100 m^2 of long-term, natural stream conditions with a variety of hydraulic habitats suitable for arctic grayling (*Thymallus arcticus*) spawning, rearing and over-wintering.

The monitoring activities in 2009 consisted of:

- Egg deposition surveys;
- Young-of-year adult habitat distribution surveys;
- Young-of-year habitat use and food availability;
- Attempts to capture adult spawning fish;
- Adult abundance estimates (when possible);
- Sedimentation, water quality and discharge monitoring; and
- Culvert assessment as a potential barrier to fish movement.

Mochnacz, Neil

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Permit No: S-09/10-3011-YK
S-09/10-3011-YK-A1
S-09/10-3011-YK-A1
Region: GW, IN, SA, NS, DC

Fish Species Studied: Dolly varden, all species (excludes marine mammals)

Distribution and habitat use of sensitive fish species in the Mackenzie Valley

Information was collected on the distribution and habitat use of fish species in selected streams and lakes of the MacKenzie River Valley. This information will be used to develop a database of new and updated information describing distribution, life history and habitat use for fish species in this region.

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Permit No: S-09/10-4017-IN
Region: IN

Fish Species Studied: Chum Salmon

Pacific salmon distribution in the western Arctic

Information was collected on the distribution of Pacific salmon in the western Arctic. Once a basic understanding of the distribution of each species has been established, annual catches can be monitored to track dispersal. A major shift in these distributions will serve as an indicator of environmental change.

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Permit No: S-09/10-3009-YK
Region: NS

Fish Species Studied: All species

Fish and fish habitat assessment to support the construction of a replacement dam along the Yellowknife River, NT

A fish and fish habitat baseline was carried out for the Yellowknife River and Bluefish Lake to identify, quantify and assess potential impacts on aquatic resources from the construction and operation of a replacement dam.

Nicol, Sandra

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Permit No: S-09/10-2001-HR **Fish Species Studied:** Sculpins Spp., Benthos
Region: SS

2009-2010 Baseline studies for Avalon Ventures Ltd. proposed Thor Lake rare earth metals project

To provide a description of the temporal and/or spatial change in waterbodies of the Thor Lake area, we collected samples of water, sediment, and aquatic invertebrates. Collection of water quality data began in 2008 and continued in 2009, in conjunction with sediment and aquatic biota sampling.

This field program took place on Thor, Elbow, Long, Fred, Cressy, Kinnickinnick, Thorn, and Megan Lakes, as well as two unnamed lakes, the Great Slave Lake dock site, and six stream sites. Data was collected on fish population and habitat, water and sediment quality, and invertebrate community structure in March, June and August 2009. Stream habitat assessments examined microhabitat, substrate, cover and refugia, stream bank characteristics, riparian vegetation, connectivity and barriers to fish passage, and stream flow for six key streams in the study area, following standard habitat assessment protocols. Tissue and other samples from a range of species and size classes were used to establish fish contamination baseline data. Baseline water quality was assessed by sampling for general chemistry, metals, radionucleotides, and nutrients, and water column profiles of dissolved oxygen, temperature, pH, conductivity and salinity. Sediment samples were collected to measure sediment quality Parameters, including metals, radionucleotides, nutrients and particle size. Invertebrate community structure was characterized using additional water and sediment samples. Ice thickness was also measured in March 2009.

Reist, Jim Freshwater
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Permit No: S-09/10-4012-IN **Fish Species Studied:** Arctic Charr
Region: IN

Baseline fish study and charr community-based monitoring plan for Sachs Harbour

The purpose of this study was to conduct baseline studies for freshwater fish and anadromous fish in the areas surrounding Sachs Harbour, in order to provide local HTC and DFO fisheries managers with a "big picture" of what is occurring in the region. Arctic charr were sampled from the Sachs Harbour area and analyzed by a Master's student at Trent University. Arctic charr otoliths, tissue samples and stomach contents were also sampled for follow-up analyses. This project will provide the following information:

1. length, weight and age frequencies;
2. responses of charr to variability in the context of climate change;

3. baseline conditions and current charr biodiversity, which will provide a point of reference against which future changes can be compared;
4. data and knowledge that can be used to create and implement a community-based monitoring plan;
5. future (follow-up) assessments of genetic and morphological variation, and genetic population structure and variation, in the dynamics of charr populations within the Sachs Harbour area; and,
6. development of a long-term community-based monitoring plan for charrpopulations in the area.

Stern, Gary

Freshwater Institute
Winnipeg, MB R3T 2N6

Permit No: S-09/10-4001-IN **Fish Species Studied:** Beluga
Region: IN

Assessment of contaminants, disease and health effects in beluga whales through harvest-based monitoring at Hendrickson Island, NT

The sampling program ran from July 01 to July 31 on Hendrickson Island. Community members took measurements and collected sample tissue (e.g. blubber, liver, kidney, muscle/meat, skin, blood, reproductive organs etc.) from beluga whales during regular subsistence hunts at their respective whaling camps. The hunters permitted access to their landed whales for sampling (aging structures, tissues for contaminants testing, and disease testing) and measurement (girth, length, fatness). In addition, samples were frozen for preservation to build on the long-term data set from this contaminant program, as well as for consistency.

We learned by observing the local expertise that have previously sampled and monitored the whales at Hendrickson Island. Beluga liver, muscle, lymph, lungs, kidney, blood, and blubber tissues were sampled for contaminants, toxicity and health indices and genetics. Male and female reproductive units were sampled for pathology, disease and mating information. Samples were sent to DFO labs in Victoria and Winnipeg.

Tonn, William

University of Alberta
Edmonton, AB T6G 2E9
bill.tonn@ualberta.ca

Permit No: S-09/10-3003-YK **Fish Species Studied:** All species
Region: NS

Improving fish habitat connectivity to enhance productive capacity of arctic freshwater ecosystems

Baseline habitat data was collected using bathymetric surveys, habitat assessments and water quality measurements. Baseline biological data was collected and included surveys of littoral flora and fauna, zooplankton, fish and foodweb structure. In stream baseline habitat data was collected and included measurements of discharge, stream reaches, habitat enhancement and water quality. Baseline biological data was collected on macrophytes, periphyton, benthic macroinvertabrates, drift and fish.

Vecsei, Paul

9 - 4905 - 48th ST

Yellowknife, NT X1A3S3
Paul_vecsei@golder.com

Permit No: S-09/10-3010-YK **Fish Species Studied:** Cisco
Region: NS

Cisco diversity survey in Great Slave Lake and Yellowknife River

The objectvie of this work was to:

1. determine the diversity of cisco species in Great Slave Lake;
2. characterize age structure and growth of individuals;
3. determine prey abundance in capture locations; and
4. to educate locals by involving them in the collection of data, and by presenting results to communities.

Wrona, Fred

P.O. Box 3050, Stn CSC
Victoria, BC V8W 2Y2
wrona@mail.geog.uvic.ca

Permit No: S-09/10-4003-IN **Fish Species Studied:** Pond Smelt, Lake Trout, Least Cisco
S-09/10-4003-IN-A1
S-09/10-4003-IN-A2
Region: IN

Hydro-ecological responses of arctic tundra lakes to climate change and landscape perturbation

The objective of our overall research program is to improve our knowledge of present-day food webs and productivity in small arctic pond/lake systems in order to better predict changes that could occur under changing climate.

The specific objectives of this research were to:

1. characterise the food web (including fish) in 12 Mackenzie Upland lakes, and to determine the relative importance of top down vs. bottom up controls on the zooplankton communities;
2. characterise the trophic structure within the food web of each lake using stable isotope signatures; and
3. validate biological assumptions made in lake ice/ecological computer models utilizing field measurements of the parameters.

Abernethy, Dave
Acting Evironment Superintendent - Operations
BHP Billiton Diamonds Inc.
#1102, 4920 52 Street
Yellowknife, NT X1A 3T1

Permit No.: 5677	**Species**: Caribou, grizzly bears, wolves, wolverines,upland breeding birds, raptors
Region(s): NS	**Location**: EKATI Diamond Mine

Wildlife effects monitoring program (WEMP)
This study aims to monitor wildlife within the vicinity of the mine. Specifically, the objectives of this program are to verify the accuracy of the predicted effects determined in the Environmental Effects Report (1998) and the Comprehensive Study Report (June 1998), and to ensure that management and mitigation measures for wildlife and wildlife habitat are effective in preventing significant adverse impacts to wildlife.

Armstrong, Terry
Bison Ecologist
ENR South Slave
PO Box 900
Fort Smith, NT X0E 0P0

Permit No.: 4771	**Species**: Wood bison
Region(s): NS	**Location**: Fort Providence area

Mackenzie wood bison population monitoring project
The Mackenzie bison population is currently afforded a measure of protection against infection by *Brucella abortus* (causes brucellosis) and *Mycobacterium bovis* (causes tuberculosis). This will be carried out through the maintenance of a bison free buffer zone preventing the contact of uninfected bison with infected bison from Wood Buffalo National Park.

Armstrong, Terry
Bison Ecologist
ENR South Slave
PO Box 900
Fort Smith, NT X0E 0P0

Permit No.: 4770	**Species**: Wood bison
Region(s): SS	**Location**: Fort Smith - Grande Detour area

Validating a technique to salvage semen from infected wood bison
Wood bison in the Slave River Lowlands and Wood Buffalo National Park (WBNP) are infected with *Mycobacterium bovis*, which causes bovine tuberculosis, and *Brucella abortus*, which causes brucellosis. These diseases are of concern because they can infect other wildlife, domestic livestock and humans, in addition to reducing reproduction and survival of infected bison.This last effect has been implicated in the decline of bison numbers in WBNP between 1970 and 2000.

Armstrong, Terry
Bison Ecologist
ENR South Slave
PO Box 900
Fort Smith, NT X0E 0P0

Permit No.: 4769
Region(s): SS
Species: Wood bison
Location: Slave River Lowlands area

Slave River Lowlands bison population monitoring
There are two bison herds in the Slave River Lowlands, the Hook Lake herd east of the Slave River and the Little Buffalo/Grande Detour herd west of the Slave River. These herds have declined to low densities since 1970, when there were about 2500 bison in the Lowlands.

Arquilla, Brian
Wildlife Biologist
Golder Associates Ltd.
9, 4905-48th St.
Yellowknife, NT X1A 3S3

Permit No.: 5669
Region(s): NS
Species: Various wildlife species
Location: Lou Lake study area

Wildlife baseline studies for the Fortune Minerals NICO project
The purpose of this study is to expand on previously collected information on the presence, distribution, habitat associations and relative abundance of various wildlife species within the project site. These studies will assist in identifying environmental impact mitigation measures that will minimize potential impacts on the local wildlife and environment.

Bartlett, John
Environment Superintendent
De Beers Canada Inc
300-5102 50 Ave
Yellowknife, NT X1A 3S8

Permit No.: 5670
Region(s): NS
Species: Caribou, grizzly bears, wolves, wolverines,falcons, waterfowl, upland birds
Location: Snap Lake Mine and Lutsel K'e

De Beers Snap Lake Mine: 2009 wildlife effects monitoring program
This program is designed to detect, monitor, and measure environmental effects that may impact wildlife habitat, wildlife behaviour and distribution, and wildlife mortalities associated with mine activities. The annual monitoring program is intended to provide information for the mine's environmental management system, in order to adaptively manage the mine, to protect wildlife and wildlife habitat, and to contribute regional monitoring information that may then be used to assess cumulative effects of mining on wildlife. More specifically, the objective of this program is to determine annual variability of the following information: the relative abundance, distribution, group composition

and behaviour of caribou; the relative activity of grizzly bears and wolverines; the presence and production of wolves and nesting falcons; and the density and species richness of waterfowl and upland birds.

Bayne, Eric
Professor
University of Alberta
CW405, Biol. Sciences Building
University of Alberta
Edmonton, AB T6G 2E9

Permit No.: 5619

Region(s): DC

Species: All forest passerines, marten, black bear, moose, snowshoe hare, voles, deer mouse

Location: Deh Cho

Quantifying boreal bird and mammal response to human land use practices in the Northwest Territories

Increased demand for oil and gas has resulted in a substantial increase in energy sector activity in the boreal forest. There is not currently a good understanding of the short term impacts of seismic lines on many species of wildlife, nor their long term recovery trajectories. To provide these missing data, this project aims to study (1) species' behavioral response patterns to different line types, and (2) changes in community composition and occupancy rates to varying line densities.

Short term objectives of this study are to determine (1) if forest birds display an avoidance response to seismic lines at different states of vegetation recovery, and if the establishment of breeding territories differs near different line ages; (2) if forest bird community structure differs between seismic lines at different states of recovery, and between locations with varying densities of seismic lines; (3) if large mammals, specifically marten and black bears, display avoidance responses to seismic lines at different states of vegetation recovery; and (4) if occupancy rates are influenced by seismic line density. Long term objectives are to identify thresholds for line density, at which species occupancy and community structure change dramatically from undeveloped habitat, and regeneration thresholds for lines where they can be considered "recovered" and removed from density threshold calculations.

Ben-David, Merav
Associate Professor
University of Wyoming
1000 E. University Avenue
Larmie, WY, 82071 USA

Permit No.: 7408

Region(s): IN

Species: Polar bear

Location: Beaufort Sea - approximately 100 to 900 km north of Kakovik, Alaska

Adaptive long-term fasting in land and ice-bound polar bears

This study follows the largest segment of the world's polar bear population, which contends with different conditions than those experienced by groups of polar bears spending the summer on shore.

Branigan, Marsha
ENR - Inuvik Region
Bag Service #1
Inuvik, NT X0E 0T0

Permit No.: 5592
Region(s): IN
Species: Barren-ground caribou
Location: Inuvik region

Collaring of Tuktoyaktuk Peninsula, Cape Bathurst, and Bluenose-West barren-ground caribou

Baseline data on movements, productivity, composition, and recruitment of these herds is required to assess the impact of industry-related cumulative effects and to monitor recovery of the herds. The objectives of this study are to collar caribou of each herd for the photocensus in July 2009, and to monitor caribou movement and range use by GPS collars.

Carriere, Suzanne
Biologist
ENR Wildlife
600, 5102 50th Ave
Yellowknife, NT X1A 3S8

Permit No.: 5620
Region(s): IN, SA, DC, NS, SS
Species: Small mammals, snowshoe/arctic hare
Location: Inuvialuit Settlement, Sahtu Settlement, Deh Cho, North Slave and South Slave regions

Northwest Territories small mammal and hare survey - season 2009

The objectives of this study are as follows: to quantify density indices for small mammal populations, in order to determine population cycles and predict the harvest potential of furbearers; to provide baseline ecosystem information; and to test for presence of Hantavirus in deer mice. This project also aims to estimate hare density and determine hare population trends, through annual monitoring of long term transects.

Cluff, Dean
Regional Biologist
ENR North Slave
3803 Bretzlaff Drive
PO Box 2668
Yellowknife, NT X1A 2P9

Permit No.: 5679
Region(s): NS
Species: Wolf
Location: Dettah/N'Dilo, Lutsel'Ke and Wekweètı

Index of abundance for tundra-denning wolves

Management plans prepared for barren-ground caribou herds recommend monitoring for trends in predator abundance. The size of wolf populations are notoriously difficult to estimate, especially in the case of wolves that follow migratory barren-ground caribou. The objectives of this study are to establish an annual relative abundance index for tundra wolves, to investigate wolf population response to changing caribou abundance, and to quantify frequency of den site usage.

Cox, Karl
Wildlife Technician
ENR South Slave
Box 900
Fort Smith, NT X0E 0P0

Permit No.: 4767
Region(s): NS
Species: Wood bison
Location: Fort Providence area

Bison control area program 2008/2009 surveillance season
The specific goal of the bison control program in the NWT is to reduce the risk of infection of the Mackenzie and Nahanni-Liard herds with tuberculosis and brucellosis. Objectives of the program are threefold: to continue surveillance of the bison control area (BCA), to maintain the BCA free of bison and to prevent the establishment of any herds within its boundaries, and to increase public awareness of the Bison Control Program. Four types of surveillance of the BCA are scheduled: weekly shoreline patrols, semi-comprehensive surveillance of the high probability area, comprehensive surveillance of the BCA, and verification patrols.

Croft, Bruno
Caribou Monitor Specialist
ENR North Slave
3803 Bretzlaff Drive
PO Box 2668
Yellowknife, NT X1A 2P9

Permit No.: 5671
Region(s): NS, SS
Species: Barren-ground caribou
Location: Bathurst caribou late winter and fall ranges

Bathurst caribou health, condition and contaminants monitoring
Health, body condition and parasite status of barren-ground caribou provide important information on the status of the herds and on the potential for population growth. Samples taken from animals harvested for health assessments permit the determination of current levels of environmental contaminants and any trends in contamination levels over time.

The objectives of this study were as follows: to collect information on the health, diseases and parasites of Bathurst caribou to assess current status and monitor trends over time; to collect information on the body condition of caribou on the Bathurst range during the fall, which can be used to assess nutritional status and predict pregnancy rates; to collect information on the presence of environmental contaminants in caribou, in order to assess current exposure and trends over time; and to compare this information to previous data collected from the Bathurst and other caribou herds across the north using a standardized protocol.

Croft, Bruno
Caribou Monitor Specialist
ENR North Slave
3803 Bretzlaff Drive
Box 2668
Yellowknife, NT X1A 2P9

Permit No.: 5672
Region(s): NS

Species: Barren-ground caribou
Location: Vicinity of Behchokò, WhaTi, Gamètì, Wekweètì, Dettah and Lutsel K'e

Monitoring of the Bathurst caribou herd

The objectives of this monitoring program are as follows: to continue to acquire location data from satellite collars, currently deployed on 20 cows (up to 30 if approved by community elders) from the Bathurst caribou herd; to relate movements of satellite collared cows to ecological conditions (plant growth, insect activity and snow depth); to measure annual calf survival in March-April and compare herd trends; to measure fall sex ratio, in October; to deploy up to 13 additional satellite collars on female Bathurst caribou; to understand the types of forage species used and if they change over winter; to understand the use of burned areas; to understand limiting effects of snow conditions; to understand the role of density dependence in dictating movement of caribou; to understand the potential role of predation risk in influencing caribou distribution; and to measure mosquito and oestrid fly abundance, in conjunction with weather parameters that might influence insect activity.

Davison, Tracy
ENR - Inuvik Region
Bag Service #1
Inuvik, NT X0E 0T0

Permit No.: 5595
Region(s): IN

Species: Barren-ground caribou
Location: Inuvik region

Photocensus, late winter recruitment and fall composition surveys of the Tuk. Peninsula, Cape Bathurst and Bluenose West barren-ground caribou herds

This project is composed of three subprojects: a late winter recruitment survey, a photocensus survey, and a fall composition survey. The purpose of the late winter survey is to obtain a current estimate of late winter recruitment of the three caribou herds; recruitment estimates (e.g., the number of calf caribou that will enter the adult population each year) are one of the key means for determining future growth potential of a caribou population. The purpose of the photocensus is to obtain current estimates of the number of caribou in the three herds, which is required to ensure that the harvest is sustainable and to monitor population trends. The purpose of the fall survey is to obtain current estimates of the fall composition (adult sex ratio and number of calves per 100 cows) of the three herds. Monitoring the number of calves provides an indication of the number of calves surviving from birth to the fall.

Davison, Tracy
ENR - Inuvik Region
Bag Service #1
Inuvik, NT X0E 0T0

Permit No.: 5594
Region(s): GW

Species: Boreal woodland caribou
Location: Inuvik region; Gwich'in Settlement Area

Ecology of boreal woodland caribou in the lower Mackenzie Valley, NT.

Boreal woodland caribou have been listed as "threatened" under the National Species at Risk Act. Recovery and conservation plans are being developed; that process requires baseline scientific and traditional knowledge. There are currently 14 active collars on adult female boreal woodland caribou. The objectives of this study are: to obtain estimates of home range size and seasonal movements of adult males and females; to determine patterns of habitat use and selection, including use of areas burned by wildfires and areas in relation to man-made linear features; to map the relative probability of occurrence of boreal woodland caribou across the Gwich'in Settlement Area; to identify seasonal habitats that may be limiting; and to obtain estimates of productivity, recruitment and survival rates.

Davison, Tracy
ENR - Inuvik Region
Bag Service #1
Inuvik, NT X0E 0T0

Permit No.: 5597
Region(s): IN, GW

Species: Barren-ground caribou
Location: Inuvik region

Caribou body condition and health monitoring
This project will use specific samples from hunter-killed caribou to track the general body condition of barren-ground caribou. The primary objectives of this study are as follows: to monitor the estimated body weight, body fat and body protein of adult cow caribou over the winter and to monitor trends over time; to monitor selected fat depots of adult bull caribou over the winter and to document trends over time; to investigate the relationship of these trends to other indicators, such as pregnancy rate, calf survival, herd size, timing of spring thaw, fall storm patterns, and winter range snow depth; to compare body condition to other herds being monitored using the same standardized system across the north; and to monitor parasite and disease levels.

Derocher, Andy
Professor
University of Alberta
CW 405, Dept. of Biol. Sciences
University of Alberta
Edmonton, AB T6G 2E9

Permit No.: 5596
Region(s): IN

Species: Polar bear
Location: Southern Beaufort Sea

Populations and sources of recruitment in polar bears
The purpose of this study is to monitor the movement (via GPS satellite transmitters) and survival of young bears and adult females. Data collected will be used to understand the vulnerability of polar bears to oil-spills, population delineation and survival rates of juveniles. New information from this study will also be used in environmental impacts statements and assessments and in reviewing oil-industry plans for exploration, development and transportation in the Beaufort Sea.

Derocher, Andy
Professor
University of Alberta
CW405, Dept. of Biol. Sciences
University of Alberta

Edmonton, AB T6G 2E9

Permit No.: 5598
Region(s): IN
Species: Grizzly bear
Location: Inuvialuit Settlement Region (Inuvik and Tuktoyatuk)

Ecology of grizzly bears in the Mackenzie Delta oil and gas development area
Development in the Mackenzie Delta encompasses a significant portion of the Inuvik and Tuktoyaktuk grizzly bear hunting area. The objectives of this study are as follows: provide baseline information on the population ecology of grizzly bears, during the pre-development phase; describe seasonal movements and distribution in the area of the Mackenzie Delta; describe seasonal patterns of habitat use and selection; develop models to assess the potential cumulative impacts of human activities; monitor changes in habitat use and movement patterns during the initial and post-development stages of pipeline construction; determine how oil and gas exploration, development and production activities may affect normal movements of grizzly bears in the area; assess levels of risk to bears from increased human activities; document and map den habitat; map critical food resources; and test the quality of models developed pre-development using information from collared bears during and post-pipeline construction. Collared bears will also be monitored by ENR staff for demographic parameters. Project results will be used to improve grizzly bear management and the ability of co-management boards to develop protocols to prevent significant population declines with increasing resource extraction activities.

Dixon, Lynne Wildlife
Biologist Canadian
Wildlife Service Room
200, 4999-98 Ave
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Permit No.: 7401
Region(s): IN
Species: Long-tailed ducks
Location: McKinley Bay

Identification of Beaufort Sea migration corridor for sea ducks
The development of offshore oil production facilities is currently underway in important sea duck migration corridors, along the Beaufort Sea coast, and more development is expected to occur. Existing data suggest dramatic declines in the western arctic breeding populations of king eiders, long-tailed ducks and common eiders. Detailed information on location and timing of use of the migration corridor is needed to better predict and mitigate any adverse effects of offshore oil development on sea ducks. The objectives of this project are as follows: determine specific migration routes for declining western Canadian breeding populations of long-tailed ducks; document temporal and spatial relationships of migrating long-tailed ducks to pack ice, islands, shorelines and other physical features of the Beaufort Sea; and identify wintering, staging and molting areas, and their affiliation with specific breeding areas.

Elkin, Brett
Disease Contaminants Specialist
ENR Wildlife
600, 5102-50 th Ave
Yellowknife, NT X1A 3S8

Permit No.: 5614
Species: Harvested wildlife

Region(s): DC, NS, IN, SS, SA, GW
Location: NWT wide

Wildlife health & genetic monitoring
Collect harvested wildlife samples.

English, Colleen
Rio Tinto, Diavik Diamond Mines Inc.
5007 50th Ave
PO Box 2498
Yellowknife, NT X1A 2P8

Permit No.: 5678
Species: Barren-ground caribou, wolverine, raptors, waterfowl/shorebirds
Region(s): NS
Location: Lac de Gras

2009 wildlife monitoring program for the Diavik diamond mine
This study aims to monitor wildlife within the vicinity of the Diavik diamond mine. Specifically, the objectives of this program are: to verify the accuracy of the predicted effects determined in the Environmental Effects Report (1998) and the Comprehensive Study Report (June 1998); and to ensure that management and mitigation measures for wildlife and wildlife habitat are effective in preventing significant adverse impacts on wildlife.

Fronczak, Dave
US Fish & Wildlife Service
1 Federal Drive, Room 501
Fort Shelling, MN 55111-4058 USA

Permit No.: 4801
Species: Waterfowl
Region(s): NS
Location: Mills Lake, NT

Western Canada cooperative waterfowl preseason banding program (Mills Lake, NWT)
Preseason waterfowl banding at Mills Lake, NWT has been an on going event since 1964. In the 40 years of operation, approximately 88,000 waterfowl have been banded. Recovery information is used to help determine migration routes, assess harvest pressure, measure vulnerability to harvest pressure, estimate waterfowl production rates, and estimate the survival rates of a breeding population.

Grabke, Dan
Managing Director
NWT Energy Corporation (03) Ltd.
206 5102 50th Avenue
Yellowknife, NT X1A 3S8

Permit No.: 5680
Species: Beaver, muskrat, mink, river otter
Region(s): SS
Location: Łútsę̀lk’é

Łútsę̀lk’é mini hydro-terrestrial baseline studies

The NWT Energy Corporation is considering developing a small hydro project on the Snowdrift River near Łútsę̨lk'é, to offset the generation of electricity by diesel generators.

Green, David
Professor
Simon Fraser University
Room 8255, 8888 University Dr.
Burnaby, BC V5A 1S6

Permit No.: 5593
Region(s): IN, GW

Species: Northern yellow warbler
Location: Inuvik region

Latitudinal impacts on carry-over effects in a neotropical songbird (Dendroica petechia)
Recent migratory songbird studies have shown that events on wintering grounds can carry over into the breeding season and influence individual reproductive success and the dynamics of populations on the breeding grounds. The objectives of this study are to test the generality of winter habitat impacts on breeding success ("carry-over" effects) in neotropical songbirds, by studying a species on the western flyway, and to determine whether there is a latitudinal impact on carry-over effects. It is expected that these effects will be more pronounced for birds breeding in more energetically costly locations.

Haas, Claudia
Protected Area Biologist
ENR Wildlife
PO BOX 1320
Yellowknife, NT X1A 2L9

Permit No.: 4802
Region(s): SS

Species: Moose
Location: Buffalo Lake and River area

Moose census for Buffalo Lake and River
Moose are an important food source for aboriginal hunters. Moose densities are low in the NWT, ranging from 1 to 17 moose / 100km^2 and the extent of the subsistence hunt is unknown.

Haas, Claudia
Protected Area Biologist
ENR Wildlife
PO BOX 1320
Yellowknife, NT X1A 2L9

Permit No.: 4774
Region(s): SS

Species: Breeding birds, waterfowl
Location: Buffalo Lake

Phase 2 ecological assessment for Buffalo Lake, River and trails - breeding birds, waterfowl and vegetation
The Northwest Territories Protected Areas Strategy (NWT-PAS) outlines a series of eight steps for the planning and establishment of protected areas, including a detailed evaluation of the area's ecological,

cultural and economic values. This field work is part of the Phase 2 ecological assessment of the Buffalo Lake, Rivers and trails area, a proposed protection area.

Hegel, Troy Caribou
Biologist Environment
Yukon (V5-A) PO Box 2703
Whitehorse, YT Y1A 2C6

Permit No.: 5621
Region(s): DC

Species: Caribou
Location: Greater Nahanni Ecosystem

Population surveys and monitoring of South Nahanni and Coal River caribou herds
Recent fall composition surveys, increasing hunter traffic on the Nahanni Range Road, and reports of low numbers of large bulls suggest that the South Nahanni and Coal River herds have declined in recent years.

Johns, Brian
Canadian Wildlife Service
115 Perimeter Road
Saskatoon, SK S7N 0X4

Permit No.: 4773
Region(s): SS

Species: Whooping Crane
Location: Within 200km

Whooping crane ecology and rehabilitation
Whooping cranes are listed as an endangered species under the 2003 Species at Risk Act. Since 1966, the Canadian Wildlife Service and US Fish & Wildlife Service have increased management efforts for whooping cranes that have increased the population from a low of 21 birds in 1941 to the current population of 270 in the wild in Canada in 2008.

Kelly, Allicia
Regional Biologist
ENR South Slave
Box 900
Fort Smith, NT X0E 0P0

Permit No.: 4768
Region(s): SS

Species: Barren-ground caribou
Location: Late winter range of Ahiak and Beverly caribou; includes Lutsel K'e, Fort Resolution and Fort Smith

Health, condition and contaminants monitoring of the Ahiak and Beverly barren ground caribou herds
The objectives of this study are the following: to collect information on body condition and pregnancy rates of caribou located below and above the treeline in the NT portion of the Ahiak and Beverly caribou late winter range; to collect information on the health, diseases and parasites of Beverly and Ahiak caribou to assess current status and monitor trends over time; to collect information on the presence of environmental contaminants in caribou to assess current exposure and monitor trends over time; and to

compare this information to previous data from the Beverly and Ahiak caribou herds, and other caribou herds across the north, using a standardized protocol.

Kelly, Allicia
Regional Biologist
ENR South Slave
PO Box 900
Fort Smith, NT X0E 0P0

Permit No.: 4772
Region(s): DC
Species: Boreal Caribou
Location: Hay River to the east, Mackenzie River, GSL to the north, Redknife, Kakisa Rivers to the west

Boreal caribou population trends and habitat use in the north and south Cameron Hills area
The committee on the status of endangered wildlife in Canada listed boreal caribou as threatened. The cumulative effects of habitat destruction, hunting, disturbance by humans (including roads, seismic lines and pipelines) and predation (by wolves and black bears) are implicated in the decline of boreal caribou.

Klimstra, Jon
Wildlife Biologist
U.S. Fish and Wildlife Service
11510 American Holly Drive
Laurel, MD 20708 USA

Permit No.: 5675
Region(s): NS
Species: Mallards, northern pintail, American green-winged teal
Location: Stagg River delta, southeast of Behchokò

Western Canada cooperative waterfowl banding program - Stagg River station
The objective of this study is to band 2,000 mallards, 1,100 northern pintails, and 1,000 of all other waterfowl species at each of the approximately 20 banding stations in Canada.

Lambert Koizumi, Catherine
University of Alberta
Dept. of Biological Sciences
Edmonton, AB T6G 2E9

Permit No.: 7406
Region(s): GW
Species: Dall sheep, grizzlies, wolves
Location: Richardson Mountains, NT

Dall sheep, grizzly bear and wolf interactions in the Richardson Mountains
This project examines the spatial and dynamic relationship between Dall sheep, grizzly bear and wolves in the Richardson Mountains.

Larter, Nic
Regional Biologist
ENR Deh Cho
PO Box 240

Fort Simpson, NT X0E 0N0

Permit No.: 4973
Region(s): DC

Species: Boreal caribou, moose,beaver, wolf
Location: Sambaa K'e candidate protected area

Wildlife reconnaissance survey of candidate Sambaa K'e protected area
The objectives of this study are to collect information on the distribution and relative densities of a variety of large mammals in the Sambaa K'e candidate protected area in March, as part of the Phase 2 ecological assessment of the Northwest Territories protected area process, and to document large mammal distributions in March that verify and supplement the results from previous traditional and scientific studies conducted in different parts of the candidate protected area.

Larter, Nic
Regional Biologist
ENR Deh Cho
PO Box 240
Fort Simpson, NT X0E 0N0

Permit No.: 4972
Region(s): DC

Species: Boreal caribou
Location: Dehcho region

Continued monitoring and deployment of satellite collars on Dehcho boreal caribou
The objectives of this study are the following: to ensure that enough collars are deployed on female caribou to document their seasonal range use over multiple years in an area of boreal caribou range which has had limited fire and seismic disturbance, thus permitting the assessment of the fidelity of seasonal movements and range use over a maximum 4-year period; to ensure enough collars are deployed on female caribou to determine the period of calving and whether or not boreal caribou in this area tend to congregate in calving areas; to ensure enough collars are deployed on females to collect detailed daily movements of individual females (over a minimum 3 year period) residing in strategic areas of the caribou range; to provide empirical data to test the predictions and robustness of a previous study that predicted high value boreal caribou habitats in the Dehcho; to provide baseline information on caribou ecology prior to the construction phase of the proposed Mackenzie Gas Pipeline, which would allow a comparison with caribou ecology after the pipeline construction phase; and to provide baseline information on caribou ecology in the Arrowhead area prior to additional industrial exploration and activity.

Larter, Nic
Regional Biologist
ENR Deh Cho
PO Box 240
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Permit No.: 4975
Region(s): DC

Species: Moose
Location: Mackenzie and Liard River valleys

Moose population monitoring

There were concerns voiced over moose abundance in high use areas in the Dehcho region by all Dehcho communities during a wildlife workshop conducted by ENR in September 2002.

Larter, Nic
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Permit No.: 4974
Region(s): DC

Species: Boreal woodland caribou
Location: Dehcho Region

Continued monitoring and deployment of satellite collars on Dehcho boreal caribou
The purpose of this study was to monitor the movements and demography of boreal woodland caribou.

Larter, Nic
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Permit No.: 5026
Region(s): DC

Species: Wood bison
Location: Ft. Liard and Nahanni Butte area

Monitoring of the Liard wood bison population
The Nahanni wood bison population is currently afforded a measure of protection against infection with *Brucella abortus* (causes brucellosis) and *Mycobacterium bovis* (causes tuberculosis) by maintaining a bison-free zone in order to prevent contact with infected bison from Wood Buffalo National Park.

Latour, Paul Habitat
Biologist Canadian
Wildlife Service
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Permit No.: 5617
Region(s): DC

Species: Songbirds, waterfowl, small and large mammals
Location: Ka'a'gee Tu candidate protected area, Dehcho region

2009 ecological assessment of Ka'a'gee Tu candidate protected area
Ka'a'gee Tu is a candidate protected area, proposed through the NWT Protected Areas Strategy (NWT PAS) (Mackenzie Valley 5-Year Action Plan). At Step 5 of the NWT PAS, an ecological assessment must be conducted to identify the key ecological components in the candidate area before a final decision can be made to proceed with legally designating the site. Ecological values within Ka'a'gee Tu are generally poorly known.This study is an ecological assessment using a habitat-based approach. The objectives of this study are: to verify and describe the main habitat components (vegetation types); to develop an inventory of flora and fauna; to list key species and assess their importance for conservation; to provide

information for the identification of important ecological sites within the area; and to generate baseline data for the candidate protected area.

Lennie-Misgeld, Peter
Jacques Whitford AXYS Ltd.
5021 49 Street
Yellowknife, NT X1A 2N4

Permit No.: 5673	**Species**: Mammals, birds
Region(s): NS, SS	**Location**: Yellowknife, Fort Resolution and Lutsel K'e

2008-2010 baselines studies for Avalon Ventures proposed Thor Lake rare earth metals project - wildlife component

The objectives of the wildlife component of this project are to provide a comprehensive characterization of the baseline wildlife and wildlife habitat conditions in and around the Thor Lake project site, which will form the basis for an environmental impact assessment. The list of species to be studied is extensive, including moose, beaver, caribou, osprey, barn swallow and white-throated sparrow, among others. Three areas in particular have been identified where wildlife information relevant to the mine project are lacking.

The objectives include the following: conducting a species inventory and relative abundance counts for breeding/staging waterfowl; a species inventory and spatial distribution map of aquatic mammals for the project footprint, local and regional study areas; a species inventory, presence/absence survey, and relative abundance count of breeding songbirds for the project footprint and local study area; and an inventory of nests and dens, description of activity, and spatial arrangement in the project footprint and local study area.

Maaskant, Shirley
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MGM Energy Corp
Suite 4100, 350 7th Avenue SW
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Permit No.: 7404	**Species**: Muskrat, wolverine, grizzly bear, moose, migratory birds and waterfowl species
Region(s): IN	**Location**: Inuvialuit Concession Lands, Inuvik Blocks 1 & 2

MGM Energy Corp. summer field assessment and advance barging and staging project: 2008-2011

This project will assess biophysical (i.e., vegetation, wildlife), archaeological and cultural resources located within the designated areas being considered for a 2009/2010 winter drilling project, including wellsites, camp sites and overland access routes. The wildlife investigation component will focus on identifying and documenting habitat for avian and terrestrial wildlife in the vicinity. Information collected during the study will be used in planning and determining appropriate locations for 2009-2010 drilling activity. Recommended set-back distances will be applied where areas of sensitive wildlife habitat are identified.

Mulders, Robert
Fur Bearer Biologist
ENR Wildlife
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Permit No.: 5613
Species: Wolverine
Region(s): NS
Location: NWT

NWT wolverine carcass collection
No research was conducted under this licence.

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Permit No.: 5674
Species: Wolverine
Region(s): NS
Location: Daring Lake, Ekati, Diavik, Kennady Lake areas

Wolverine DNA sampling on the central barrens
The Committee on the Status of Endangered Wildlife in Canada (COSEWIC) has identified wolverines as a conservation priority.

Rausch, Jennie Shorebirt
Biologist Canadian
Wildlife Service
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Permit No.: 7402
Species: All birds, especially shorebirds (whimbrel, short-eared owl), gulls and terns
Region(s): IN
Location: Mackenzie Delta and Kendall Island bird sanctuary

Arctic shorebird monitoring program
The arctic shorebird monitoring program was initiated in response to widespread shorebird population declines noted on migration routes through southern Canada and the United States. The objective of the program is to produce population estimates for arctic-breeding shorebirds, and then to monitor trends in their populations over time. Four field seasons of this project have been completed in the Mackenzie Delta, and in 2009 the survey area will be further narrowed to concentrate on particularly important sites and species. This project is part of a larger program called the Program for Regional and International Shorebird Monitoring; the purpose of this program is to generate population estimates for all arctic-breeding shorebirds, to produce maps showing distribution and abundance across the North American arctic, to identify the highest-quality habitats for each species, and to provide densities and breeding ecology information at each survey site.

Richardson, Evan
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Permit No.: 5591
Species: Polar bear
Region(s): IN
Location: Mackenzie Delta, Inuvik and Tuktoyaktuk

Assessment of the potential impacts of oil and gas development on polar bears in the outer Mackenzie Delta and nearshore southern Beaufort Sea

Population sizes of polar bears in and around the study area could decline quickly, should the maximum sustainable yield be exceeded as a consequence of factors such as increased numbers of bears being destroyed as public nuisances, or environmental damage to habitat, prey species or the bears themselves. Thus, it is important to describe the location and importance of critical habitats, to identify and quantitatively assess possible impacts of development on polar bears, and where possible, to make recommendations to minimize or mitigate potential problems. In particular, the objectives of this study are: to identify potential polar bear maternity denning habitat and assess the potential for den disturbance as a result of oil and gas activities; to assess the risk and potential impacts of offshore activities to the southern Beaufort Sea polar bear population; and to assess the impact of nearshore activities on Inuvialuit polar bear hunting along the nearshore areas of the southern Beaufort Sea coast from Mackenzie Bay to the Tuktoyaktuk Peninsula.

Schock, Danna
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Faculty of Veterinarian Medicine
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Permit No.: 4775
Species: Wood frog, boreal chorus frog, northern leopard frog, Canadian toad, red sided garter snake
Region(s): SS
Location: areas accessible near Fort Smith, Tsu Lake, and surrounding areas; Wood Buffalo National Park

Amphibian monitoring in the Northwest Territories

Very little information exists on the occurrence and occupancy of amphibians in the NWT. The NWT has two amphibians that are listed as a Special Concern under the Federal Species At Risk Act (SARA): the northern leopard frog and the western toad. This project will increase our monitoring efforts for northern leopard frogs, along with the Canadian toad, boreal chorus frog, and wood frog. As well, red-sided garter snakes often occur in the same habitats as these amphibians, and any encounters with this species will be included in the report to the NWT upon completion of the project.

Scott, Adam
BBC Natural History Unit
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Bristol, UK BS8 2LR

Permit No.: 5676
Species: Caribou - Rangifer tarandus
Region(s): NS
Location: North of Courageous and Jolly Lakes (Wekweèti)**BBC**

Frozen Planet filming of Bathurst caribou herd, fall 2009
The objective of this project is to film the Bathurst caribou herd during their fall migration and during the rut. The autumn episode of Frozen Plant will tell the story of the herd migrating towards the treeline, and the importance of the rut at this time of year.

Veitch, Alasdair
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Permit No.: 5615 **Species**: Barren-ground caribou
Region(s): IN, GW, SA, NS **Location**: NWT

Surveys for the Bluenose-East and Bluenose-West barren-ground caribou herds
The purpose of this study is to conduct pre-collaring distribution surveys, caribou collaring, late winter recruitment surveys, photocensus and fall composition surveys of the Bluenose-East and Bluenose-West barren-ground caribou herds.

Wood, Cindy
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Permit No.: 7403 **Species**: Geese (Canada, lesser snow, greater white-fronted), other waterfowl
Region(s): IN **Location**: Inuvialuit Settlement Region

Population management of geese and swans in the Inuvialuit Settlement Region using aerial surveys and banding studies
The Inuvialuit Settlement Region of the western Canadian Arctic is an important breeding and moulting area for Greater White-fronted Geese, Canada Geese, Lesser Snow Geese, and several other species of waterfowl. Information on bird numbers, distribution, survival, and productivity is needed to determine if current local and international harvest levels are sustainable, and to ensure that populations are conserved for the long-term use of the Inuvialuit and other people residing or hunting within the migratory range of these species.

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Permit No.: 7405 **Species**: Snow geese
Region(s): IN **Location**: Inuvialuit Settlement Region

Snow goose population study on Banks Island
No research was conducted under this licence.

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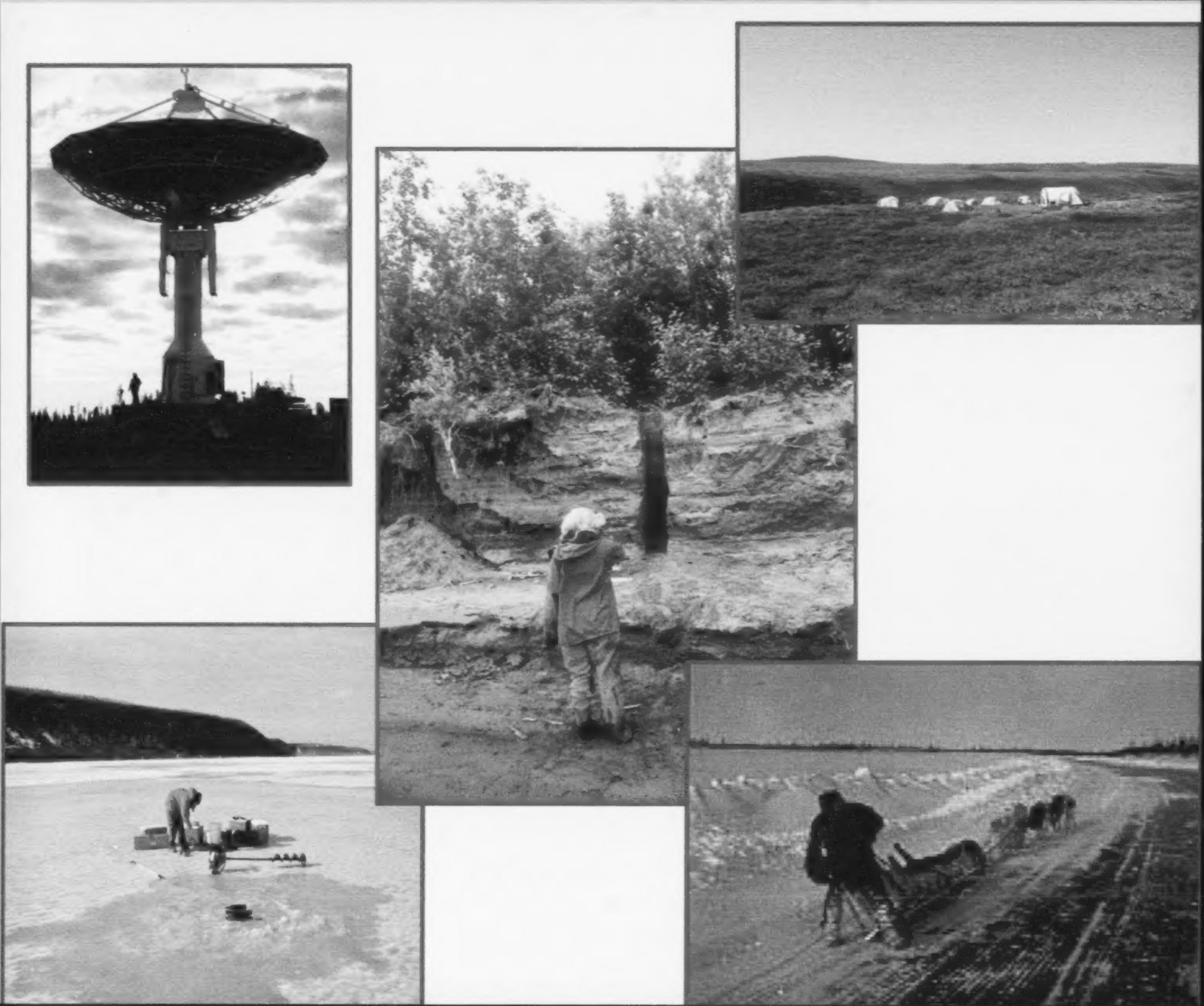
Permit No.: 5616	**Species**: Waterfowl
Region(s): All NWT	**Location**: Mackenzie River drainage

Cooperative waterfowl population surveys in the Northwest Territories
To conduct aerial surveys of waterfowl in the Mackenzie River drainage basin. Study conducted under Canadian Wildlife Services (Environment Canada).

2010 Licenced Research Projects



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File Number: 12 402 842 **Licence Number:** 14643
Region(s): SS **Location:** Norman Wells, Bosworth Creek

Bosworth Creek aquatics and fisheries monitoring program
The objective of this program was to determine current water and aquatic habitat quality, and to establish baseline conditions for evaluation of future monitoring data. In order to achieve the project objectives, sampling stations within and downstream of the active Imperial Oil Norman Wells lease area (the "site") are compared to upstream reference stations located beyond the possible influence of the site development. Work in 2010 included the following components: surface water quality, benthic invertebrate analysis and fish habitat assessment. Stations were monitored seasonally (summer and fall) to characterize natural temporal variability in conditions and to identify potential trends over time.
A presence/absence fish survey was conducted in June and August 2010. Fish species captured in June included sculpin species, burbot and a cyprinid species. Fish captured in late August included those species captured in the spring as well as numerous Arctic grayling juveniles. Data from the 2010 water quality, fish habitat and benthic invertebrate assessments are still being analyzed.

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File Number: 12 402 875 **Licence Number:** 14787
Region(s): NS **Location:** Lac de Gras and surrounding area

Lichen sampling program - Diavik
This research was conducted from Sept 8-12, 2010. Lichen and soil samples were collected and analyzed, with results indicating that 17 out of 21 samples in the near-field area had statistically higher concentrations of metals than did samples from far-field areas. A risk assessment was conducted to determine if concentrations of metals in lichen were within safe levels for consumption by caribou. The risk assessment included soil and lichen data, as well as water quality data collected from the Diavik study area. Assumptions, such as 100% bioavialability of metals and that caribou respectively spend 100% of their time within the near- and far-field study areas, ensured that the results of the risk assessment were conservative. Exposure ratio values were less than 1 (the safe level) for the majority of metals analyzed; the exception was aluminium, which had exposure values ranging from 2.8 to 3.5. Despite this result, health effects on caribou are not expected to occur because of the conservative assumptions used in the risk assessment.

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File Number: 12 402 263 **Licence Number:** 14784
Region(s): SS **Location:** Nonacho Lake

Nonacho Lake trout study program
Lake trout eggs were collected from nets embedded in the lake bottom at selected sites. Very low numbers of eggs were collected, ranging from 0 (at 17 of 24 sites) to 104, with a total of 195 eggs harvested. These data will be used to determine egg densities at various depths, in order to determine the preferred spawning depth of lake trout in Nonacho Lake. A small number of other fish (1 burbot, 7 white suckers and 9 slimy sculpins) were caught accidentally and released without harm. Twenty adult lake trout were also caught by angling and killed. Tissue samples were obtained from these fish for mercury testing for a public health assessment. Standard fish sampling data was obtained from these fish at the same time, including length, fork length, mass, sex, liver mass, gonad mass, stomach fullness and contents, and otoliths (ear stones used for age determination). Harvested fish ranged from 555-890 mm in length and 1428-6577 g in mass.

The information gathered is one component of the effects assessment for the proposed Taltson Hydroelectric expansion project, and will help to determine the extent to which water level fluctuations will impact spawning fish in this system.

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File Number: 12 402 529 **Licence Number:** 14733
Region(s): IN **Location:** Camp 1 - Minto Camp (Minto North GEM base camp)
Camp 2 - Kuujjua (Kuukyuak) River Camp
Camp 3 - unnamed lake near Winter Cove

Flora of the Canadian Arctic - diversity and change
Our long term goals are to: 1) produce the first field guide to all plant species of the Canadian arctic, entitled "Flora of the Canadian Arctic"; 2) implement an Arctic Plant website to provide easy access to information; 3) undertake studies on diversity and distribution of arctic plants and mosses; and 4) obtain DNA barcodes for all Canadian arctic plants.

Our objectives on Victoria Island in 2010 are to a) document vascular plant and moss species in areas that are botanically unknown or poorly known; b) obtain complete plant inventories of selected areas as baseline data for long term monitoring; c) do taxonomic studies to clarify species limits of taxonomically problematic plant groups and d) collect samples for DNA barcoding studies. The focus is on a different arctic region each year, while attempting to cover as many sites within a region as possible. In 2009, the purpose was to undertake fieldwork in northwestern Victoria Island, NWT. At each camp, there will be research undertaken both in the vicinity of camp (within walking distance) and at more distant sites reached by helicopter. Helicopter access is essential, in order to adequately document the plants of a larger area. Plant specimens will be collected (both herbarium specimens and leaf material preserved in silica gel for DNA studies), photographed, and studied. There will be generally 1-5 plants collected per species; if a plant is quite large only part of the plant will be taken. Collections will be deposited at the National Herbarium of Canada, Canadian Museum of Nature (CMN), and lab research will take place at the CMN.

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File Number: 12 402 850 **Licence Number:** 14759
Region(s): IN **Location:** Inuvik, Tuktoyaktuk and Sachs Harbour

Collecting of parasitic wasps (Hymenoptera: Braconidae: Microgastrinae)
The only data available in the Canadian National Collection for most insects is from the early 1980s, before global warming-induced changes in the Inuvialuit region.

From all sites, the research team collected 38 properly preserved specimens. The numbers were much lower than expected because of the marked shift in seasonality that was previously unknown. Based on several insect groups, the shift appeared to be about three weeks. Thirty-five out of 38 specimens (92%) rendered full DNA barcodes. They represent 14 species in total, which is roughly half the total number of species and specimens from the NWT that have been barcoded. Since the last official record of species for the Northwest Territories is 10 species, 1.4 times as many species were captured as have been previously published.

From experience based on Yukon collections, it is suspected that there are at least 70 species awaiting discovery in the northern part of the Northwest Territories.

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File Number: 12 402 780 **Licence Number:** 14765
Region(s): SA **Location:** Bosworth Creek

Bosworth Creek Monitoring Project
The Bosworth Creek Monitoring Project (BCMP) is moving into its 5th year of study and is continuing to provide unique educational opportunities for local youth. This year, elementary and high school students from Mackenzie Mountain School (MMS) went out on several field trips to learn about local freshwater habitat. A graduate student from the University of Prince Edward Island is studying water bugs in the creek and taught students about how important they are for monitoring local water quality. These field trips and the follow-up classroom projects have become part of the local high school curriculum through the GNWT Experiential Science Program. Other students are studying yellow-brown

overflow ice that the BCMP has been tracking for several years. This ice has high concentrations of heavy metals and may be coming from melting permafrost. It is showing up more often and might be affecting the plants and animals that people eat. The three students (two from MMS and one from Chief Albert Wright School, Tulıt'a) will be conducting more experiments in 2011 to figure out where the yellow-brown ice is coming from, and if it is dangerous to people. The Bosworth Creek water quality study will be finished by March 31 and will provide the Norman Wells Renewable Resource Council with plain language and technical reports, as well as other monitoring tools.

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File Number: 12 402 780
Region(s): SA
Licence Number: 14827
Location: Fort Good Hope

Fort Good Hope baseline heavy metal accumulation in burbot (loshe) study.
No research was conducted under this licence.

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File Number: 12 402 685
Region(s): NS, SS
Licence Number: 14704
Location: Within and adjacent to the Thor Lake Property

2008-2010 baseline studies for Avalon Ventures Ltd. proposed Thor Lake rare earth metals project-fisheries component
The fisheries components of the 2010 Thor Lake baseline study included the following: assessments of stream habitat in May and June, collection of the second year of fish samples at five lakes in September, and collection of the first year of fish samples in one lake.

Stream habitat surveys assessed the fish habitat value of streams in the Ring Lake watershed, and any other watercourses that will be impacted by the proposed mine infrastructure (e.g. roads, buildings, air strip). The Ring Lake streams included the outlets of Ring, Buck, Drizzle and Egg Lakes (the outlet of Drizzle Lake is the only stream that is passable to fish). An investigation of the mine infrastructure footprint did not identify any previously unknown watercourses.

The fish sampling program was completed at the five lakes added to the baseline study in 2009 (Ring, Buck, Drizzle, Murky and Redemption) and at another small unnamed lake in the Ring Lake watershed. Lake whitefish, northern pike and lake cisco were captured in Redemption Lake (the control lake) but no fish were caught in the other lakes. Muscle, liver and aging structure samples were collected from lake whitefish and northern pike. These were analyzed for muscle total mercury, liver metals (both a general scan and a scan for rare earth elements), and fish age, respectively. Results were not available at the time of this summary report. This project has concluded and a 2011 program is not anticipated.

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File Number: 12 402 856
Region(s): SA

Licence Number: 14817
Location: The Great Bear River, which flows from Great Bear Lake to the Mackenzie River in the Sahtu region near the communities of Délı̨nę and Tulít'a.

Great Bear River environmental and traditional knowledge baseline program
No research was conducted under this licence.

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File Number: 12 402 333
Region(s): SA

Licence Number: 14824
Location: Offshore from Délı̨nę in the Keith Arm of Great Bear Lake.

The continuation of a community-led fish monitoring study in Délınę, NT
Lake trout, whitefish and herring were collected at Délı̨nę in 2009 and 2010 by the Délı̨nę Renewable Resource Council (DRRC) and tested for chemicals of concern. In 2010, most fish were collected by gill net about 1 km offshore from the eastern town limit. A total of 19 lake whitefish (collected in 2010 only), 22 lake trout (collected in 2009 and 2010) and 16 herring (collected in 2009 only) were measured, aged and tested for a wide range of chemicals in their muscle and liver tissues.

All three species of fish had low concentrations of chemicals of concern. Radionuclides were at, or below, detection limits in all fish samples. Uranium, radium and radioactive lead occur naturally in the environment, but were in very low concentrations in the fish species tested here. In general, other metals were also low in the meat of these fish, with compounds like cadmium, copper, and arsenic well below concentrations that could be a health concern. The average concentration of mercury in all three fish species was below the Health Canada guideline for commercial sale (0.5 mg/kg). Mercury in all whitefish and herring were far below the guideline. Mercury increased with the size of the fish in all three species tested in this study, but only larger lake trout approached the Health Canada guideline. Organochlorine pesticides were present in the fish in Great Bear Lake, but the concentrations were very low and should not be a health concern.

This study shows that chemicals of concern are low in fish from the Keith Arm of Great Bear Lake, although mercury should be monitored to ensure that levels do not increase in the future. Food basket studies conducted in 2002, by the Canada/Délı̨nę Uranium Team, also showed low concentrations of chemicals in fish.

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File Number: 12 402 338
Region(s): NS
Licence Number: 14775
Location: Baker Creek and Yellowknife River/Bay

Giant Mine phase 3 environmental effects monitoring (EEM)
The objective of this study was to examine the health of two small-bodied fish species in exposure and reference areas. Small-bodied fish (slimy sculpin and ninespine stickleback) were captured using beach seines, minnow traps, backpack electrofishing, and hoop nets, and measured for weight and fork length. Thirty adult males, 30 adult females and 30 young-of-the-year were lethally sampled following recommendations (n = 20) from the Technical Guidance Document (TGD, Environment Canada) for an EEM study to ensure a large enough sample size to adequately detect statistical differences between exposure and reference areas. A non-lethal assessment of up to 400 ninespine stickleback was made. The captured fish were measured for weight and fork length, and then released. An age structure will be collected, if possible.

The same assessments (i.e. lethal and non-lethal surveys) were conducted at the reference area on the same species. All captured non-target fish species were documented and released alive.

Also a benthic survey was performed to collect invertebrates at a total of 15 stations.

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File Number: 12 402 851
Region(s): GW
Licence Number: 14774
Location: Travaillant Lake, Travaillant River

Travaillant Lake post fire pilot project
A synthesis of information from all Gwich'in Renewable Resources Board/Fisheries and Oceans Canada fisheries assessments at Travaillant Lake (2004-2010) is being compiled and should be completed by the end of 2011.

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File Number: 12 402 635 **Licence Number:** 14748
Region(s): NS **Location:** The proposed Nechalacho Mine site near Thor Lake

2010 baseline environmental studies, Nechalacho rare earth element project site
Wildlife and vegetation studies carried out in 2010 served to fill information gaps in the local study area (LSA) resulting from changes to the proposed Nechalacho rare earth element project footprint. The 2010 program included a rare plant survey, breeding bird survey and waterfowl surveys, and a desktop wildlife habitat assessment. An extension of the existing ecosystem mapping was also conducted. A total of 62 polygons, covering approximately 380 hectares, were mapped in the LSA. A total of 95 sites were assessed in the field, where wetland and upland forest types were most common.

The rare plant survey was conducted from July 19-22, 2010. A total of 29 plots were surveyed, and no rare plants were identified. Waterfowl surveys were conducted in June and July. Waterfowl were surveyed on lakes and ponds by foot and from a helicopter. A total of 814 waterfowl were observed during the surveys. Scaup species were by far the most common waterfowl observed. In June, 39 breeding bird survey stations were surveyed. A total of 337 breeding birds from 30 bird species were recorded. Ten broad habitat types available within the LSA were assessed for their ability to support chosen wildlife species (moose, barren-ground caribou, olive-sided flycatcher, rusty blackbird, and common nighthawk) for specific life requisites and seasons.

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File Number: 12 402 635 **Licence Number:** 14734
Region(s): IN **Location:** Between Inuvik and Tuktoyaktuk, along the proposed road alignment.

Inuvik to Tuktoyaktuk highway project
The objectives of this project were to determine the presence of fish and the quality of fish habitat at stream crossings along the proposed road alignment. Our objectives were achieved through observations, measurements, and surveys carried out during freshet. These observations provided an indication of seasonal habitat use at high water, when connectivity to upstream habitats may exist. Similarly, field work during low summer flows identified permanent and ephemeral streams, and confirmed fish presence under low flow conditions. An assessment was done on all stream crossings to look for obstructions, the size and quality of upstream habitats, the size and characteristics of upstream lakes, flow conditions, and identification/confirmation of streams requiring ground sampling. This was done via thorough photographic and video documentation. Quantitative habitat surveys were conducted (using BC Resources Information Standards Committee site cards), electrofishing and 24-hour Gee trapping at selected stations to sample fish species present.

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File Number: 12 402 849
Region(s): SS

Licence Number: 14752
Location: Utsingi Point, Christie Bay, Christie Bay Humps, Pethei Peninsula, Fortress Island, Wildbread Bay, McLeod Bay

Lake trout diversity and the deepwater food web

Twenty three nets were set in the deep waters of Christie Bay, including near Lutsel K'e, at the east end of Tochatwi Bay, and at Utsingi Point. A total of 146 lake trout were captured; 141 of these were dead and subsequently sampled, and 5 were sampled live and released. A digital image of each fish was collected to analyze body shape and overall appearance. Weight and lengths were recorded, gender and maturity were assessed, stomachs were extracted to assess food habits, fin clips were archived for future genetic analyses, and otoliths (bones in the head) were removed for age estimation. These structures have not been processed, nor have any data been analyzed to date.

Benthic invertebrates, zooplankton, and mysis (freshwater shrimp) were collected from four sites adjacent to the fish collection sites. These samples are currently being analyzed for species composition, abundance and biomass. These data will be used to assess prey availability and production at fish sampling sites. Data summaries and reports are not available at this time, but will be provided as they are completed.

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File Number: 12 402 412
Region(s): IN, SS

Licence Number: 14655
Location: Adjacent to and along Highway #5, between the boundary of Wood Buffalo National Park west of Fort Smith and Angus Tower and near Inuvik

Structure, carbon dynamics, and silvichronology of boreal forests

Forests absorb CO_2 from the air, and fix it as organic matter, about half of which is carbon by weight. This process can ameliorate the problem of global warming. Therefore, monitoring carbon in forests is important. The research team continued their field work from the previous year, and measured carbon that was fixed and moved within forests of jack pine and black spruce in Wood Buffalo National Park and in an area about 20 km west of Fort Smith. A similar study was also started near Inuvik at two sites: one in black spruce forest, and the other in tundra vegetation. Work was also continued on the study of "silvichronology", in which the history of carbon accumulation in forests is estimated by close examination of tree rings and tree sizes. For this part of the study, about 50 trees of various sizes were cut at scattered locations in the forests, and stem disks were collected from various heights of the trees for detailed tree-ring analysis. Thanks to the local residents who helped us fell larger trees with chainsaws. The stem samples are being analyzed at the Forestry Canada research lab in Edmonton and at Kyoto University, Japan.

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File Number: 12 402 848
Region(s): NS
Licence Number: 14744
Location: Yellowknife River between Prosperous Lake and Bluefish Lake

National Thermal Power Corporation (NTPC) Bluefish Hydro repairs

Research conducted on the Yellowknife River related to the proposed construction of a new dam at the Bluefish Hydro Facility was limited to a survey of fish habitat on Bluefish Lake. A one-day survey of Bluefish Lake bathymetry and lake bottom substrate identified only poor-quality trout spawning habitat. This indicates that the addition of new shoals may be a suitable means of compensation for the loss of fish habitat resulting from the new dam.

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File Number: 12 402 752
Region(s): SS
Licence Number: 14721
Location: "Fox Holes Lakes" (unnamed water bodies); nearest community is Ft. Smith, approximately 40 km to the east

Molecular analysis of evolutionary change in stickleback populations

The main goal of this research project was to understand how changes in an animal's DNA can lead to changes in the formation of its skeleton. Also, if the same skeletal changes occur in multiple populations, is the same genetic change always responsible?

Ninespine sticklebacks in the Fox Holes Lakes are excellent models for investigation of the evolution of skeletal changes in wild populations, because fish in this population do not have hind fins (also called pelvic fins). This is highly unusual, and is the equivalent of a human missing his or her legs. Identification of the genetic changes that cause this skeletal modification in fish will help us understand skeletal development in humans and other animals as well.

From May 19-20, 2010, the research team collected fish using minnow traps. In Fox Holes Lakes, the team trapped a mix of brook and ninespine stickleback in vegetation near the road leading to the site. These fish were brought back to the lab. Some of the fish were used for breeding experiments (offspring were kept in captivity only) and DNA was extracted from other fish. Together, these experiments will help us identify the genes responsible for skeletal differences among different populations.

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File Number: 12 402 724 **Licence Number:** 14646
Region(s): NS **Location:** Lac de Gras

Improving habitat connectivity to enhance productive capacity of arctic freshwater ecosystems
The Diavik Diamond Mine, located on Lac de Gras in the Northwest Territories, has proposed a habitat compensation project for nearby lake and stream systems. Work was conducted according to plan. In 2010, lakes and streams were sampled for hydrology, water quality, habitat characteristics, primary producers, invertebrates, and fish, in order to establish pre-manipulation baseline conditions in these ecosystems. Analysis of water samples revealed that water quality is similar among all streams. Water quality data on the lakes indicate that all are oligotrophic. Habitat assessments indicate that stream riparian zones are dominated by shrubs, forbs, grasses, mosses and boulders, while streambeds are sparsely vegetated and composed predominately of inorganic fines, boulders, and pebbles. Because of low, diffuse flows and cascades that obstruct movement of fish from Lac de Gras, streams support few fish; electrofishing and hoop netting in streams revealed low abundances of slimy sculpin and juvenile burbot. Lake fish assemblages were surveyed by gill netting, angling, and electrofishing. Fish communities and species abundances vary among lakes, but consist mainly of arctic grayling, lake trout, round whitefish, burbot, longnose sucker, and slimy sculpin.

A study of the macroinvertebrate community composition throughout the ice-free season showed diverse assemblages of invertebrates, especially dipterans, crustaceans, Oligochaeta, Mollusca, and Hydrachnidia. Macroinvertebrate recolonization was measured using colonization boxesover a period of four weeks . Emergent traps were deployed in early June and left until September, in order to record the timing of aquatic macroinvertebrate emergence into the terrestrial environment. The macroinvertebrate samples were shipped to Edmonton and will be identified and measured to assess community composition, abundance, and biomass.

Results of the project were presented at several conferences and workshops.

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File Number: 12 402 766 **Licence Number:** 14639

Region(s): NS **Location:** numerous lakes, streams and other locations within the EKATI mineral land claim boundary

EKATI aquatic monitoring program, 2009-2013
In 2010, seven separate monitoring projects were ongoing in the lakes and streams of the Koala, King-Cujo, and Pigeon watersheds, where EKATI mine infrastructure are located.

The objectives of these monitoring programs were to i) assess the current conditions in the lakes and streams of the Koala, King-Cujo and Pigeon watersheds, in order to determine whether there have been any mine effects, ii) confirm EKATI's compliance with its water licenses, and iii) assess the meteorology, hydrology, water quality, physical limnology, phytoplankton, zooplankton, benthos and fish in the area.

Data analyses for the 2010 year are currently being completed, while a detailed review of the aquatic monitoring program has been submitted to the Wek'eezhii Land and Water Board. Some highlights of the project in 2010 include the following:

- Fish populations in the Panda Diversion area were monitored for the 12th consecutive year. A compilation and analysis of this work is in progress.
- On-going Assessment of fish habitat created in Nero-Nema Stream was conducted. The Nitrate in situ Treatment Study was launched in 2010, in order to reduce nitrate concentrations in the Long Lake Containment Facility (LLCF). The study involved nutrient manipulation in Cell D of the LLCF during the open water season. Water quality, physical limnology, phytoplankton, and zooplankton were monitored during the study. Air quality was monitored using high volume air sampling and dust collection traps.

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Region(s): DC, NS, SS
Licence Number: 14807
Location: Tenneco Root River; Chalco Lake; Diversified Mine; Myrt Lake Mine; Hwy #3, Km 508; Rocher River; Pensive Lake Mine; Sunset Lake Mine

8 Sites - Phase II Environmental Site Assessment

Project activities in 2010 included:

- Identifying the physical hazards present at the site and the risks posed to ecological and human receptors.
- Identifying and quantifying the environmental impacts to all areas, including soil, sediment, surface water and groundwater.
- Quantifying hazardous and non-hazardous materials present at the sites.
- Characterizing the acid rock drainage potential for tailings, ore, waste rock, trenches and construction aggregate present at the sites.
- Collecting the required information to reduce existing data gaps and facilitate development of remedial strategies and associated cleanup costs.

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File Number: 12 402 847
Region(s): NS
Licence Number: 14730
Location: Baker Creek Watershed, near the Giant Mine, Yellowknife

Enhanced contaminant transport from thawing permafrost in freshwater ecosystems

This strategic grant is investigating the role of permafrost in affecting contaminant delivery to freshwater ecosystems in northern regions. In the Mackenzie Delta NWT, recent climate change has caused a warming and thawing of the permafrost layer. When this warming occurs, thaw slumps develop near lakes and their tributaries, having dramatic effects on the landscape and the water chemistry of nearby lakes. In 2010, the research team compiled lake water chemistry data from 28 lakes chosen along a transect east of the Mackenzie Delta, from Inuvik to Richards Island. Due to differences in local microclimate, aspect, and topography, 14 of the study lakes had retrogressive thaw slumps (i.e. degraded permafrost), and 14 lakes were in undisturbed catchments. This sample of lakes provided an ideal opportunity to assess the impacts of permafrost degradation on contaminant and nutrient delivery to lakes. In general, when compared with the set of reference lakes without thaw slumps, lakes with thaw slumps had higher dissolved ions (Ca, Mg, Na, K, SO4, Cl, HCO3), higher pH, lower dissolved organic carbon, lower total phosphorus, and lower chlorophyll a. In addition, lakes with thaw slumps also had lower total Hg and lower methyl Hg than reference lakes, possibly due to the higher pH and lower dissolved organic carbon found in thaw slump lakes, which reduce the solubility and delivery of Hg to lakes, respectively. In particular, the research team were able to directly apportion the influence of thaw slump disturbance on mercury dynamics by relating mercury concentrations in water to the proportional area of the lake's catchment occupied by a thaw slump. This is the first clear demonstration to our knowledge of the influence of thaw slump development on contaminants in lakes. Lower methyl mercury was also observed in thaw slump lakes than reference lakes, which runs counter to our predictions, because it was anticipated that deeper microbial active layers in soils from permafrost thawing and higher sulphate concentrations may contribute to increasing methyl mercury production in these systems, but this does not appear to be the case.

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Region(s): NS **Location:** Lac de Gras mine site

Waste rock studies at a diamond mine site
The growth of the diamond mining industry in Canada has brought significant economic benefits to the Northwest Territories. The long-term benefit of these activities will depend on careful environmental management of mining activities. At the Diavik Diamond Mine, mining will lead to the development of permanent stockpiles of waste-rock. When exposed to oxygen in the air, weathering of minerals in the waste rock may generate acidic drainage, that can be damaging to aquatic environments, if not managed properly. This study involves the construction of three large-scale experimental waste-rock piles, as well as an evaluation of a proposed remediation cover system. In 2010, water flow, water chemistry, rock temperature, and the changes in mineral properties of the waste-rock over time were examined. Results suggest that, in the northern environment where ambient temperatures are below freezing throughout much of the year, water flow occurs through portions of the piles and water quality reflects the mineralogy of the waste-rock, with higher sulfide-mineral bearing rock generating acidic drainage. The results from this study will assist mining companies and regulators in evaluating current waste-rock pile designs.

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File Number: 12 402 844 **Licence Number:** 14696
Region(s): NS **Location:** Giant Mine site

The presence and persistence of arsenic trioxide in soils around Giant Mine

Roasting at Giant Mine from 1949-1999 freed gold from arsenic-bearing ore and emitted arsenic trioxide and arsenic-bearing iron oxides from the stack into the atmosphere. Some of this arsenic is still present in Giant Mine soils. Arsenic trioxide is very soluble, so its presence in soils after 60 years of exposure is surprising. The objective of this research is to understand why arsenic persists in surface soils at Giant Mine. Therefore, it is necessary to understand what other minerals in soils host (or bind) arsenic, and if any of them formed from transformed roaster-derived arsenic. The influence of topography and climate on arsenic are also important.

In July 2010, the research team sampled soils and soil pore water on the Giant mine property. Soil samples were analyzed for different arsenic hosting minerals. Some hosts have not yet been documented in Giant Mine soils, and it is possible that some may have been transformed from roaster-deposited arsenic. Pore water samples show that different hosts effect how much arsenic dissolves during rainfall and snowmelt. A dry and cold climate might keep arsenic trioxide from dissolving completely. Many high-arsenic soils occur in the hollows of rock outcrops, where poor drainage might concentrate arsenic over time.

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File Number: 12 402 475
Region(s): SA
Licence Number: 14715
Location: Nota Creek C-17 well site

Phytoremediation study on the CDN forest et al Nota Creek C-17 well site

Phytoremediation is a remediation strategy that uses plants to remove contaminants. In theory, plants uptake contaminants from within the soil and are then harvested and removed from the site. This process is repeated until the impacted soil is remediated to applicable guidelines. Laboratory and greenhouse test results using soil samples collected from the salt-impacted Nota Creek C-17 well site supported proceeding with the planting of on-site test plots in 2008 and full site planting in 2009 and 2010.

Personnel traveled by helicopter to the well site in late-June 2010. The site was tilled and fertilized, and then planted with a treated three-seed mix of annual ryegrass, slender wheatgrass and creeping red fescue. Plant health and vigor was assessed in mid-August during a monitoring trip. In late-September personnel went to the site to collect plant and soil samples, to harvest the growth from the impacted areas and to remove the growth from the site. Initial laboratory results from the 2010 collected samples are encouraging. They support excavating and spreading any impacted soil still buried on the well site and proceeding with a full site phytoremediation planting in 2011.

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File Number: 12 402 681
Region(s): SS
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Location: Great Slave Lake: near Łútsęlk'é and Fort Resolution

Enhanced investigations of the factors affecting long-term contaminant trends in predatory fish in Great Slave Lake, Northwest Territories

No research was conducted under this licence.

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Region(s): SA, SS
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Location: Great Slave Lake: (East Arm) near Łútsęlk'é; (West Basin) near Fort Resolution and near Hay River Great Bear Lake (Keith Arm) near Délı̨nę

Spatial and long-term trends in persistent organic contaminants and metals in lake trout and burbot from the Northwest Territories

This study was designed to determine whether contaminant levels are changing in fish in the Northwest Territories, with a focus on Great Slave Lake. As in past years, lake trout were collected from Great Slave Lake near Łútsèlk'é and Hay River, burbot from near Fort Resolution and Łútsęlk'é, and northern pike from near Fort Resolution. Lake trout and cisco were also collected from Great Bear Lake, but the samples were not yet obtained.

The West Basin lake trout were collected by the Hay River commercial fisheries, while all other fish were collected by local community members. Collected fish were frozen and shipped south to Environment Canada-Saskatoon, where they were processed and sampled. Measurements of length, weight, sex, liver weight, gonad weight, stomach contents, and muscle moisture content were made. Muscle, liver, stomach, and otolith (lake trout and burbot) or cleithrum (northern pike) samples were collected from each fish. Otoliths and cleithra were sent to a private contractor to determine fish age. Tissue samples were submitted to Environment Canada laboratories in Saskatoon and Burlington for stable isotope (muscle) and contaminant analyses (metals in lake trout, northern pike and burbot muscle; organic contaminants in lake trout muscle and burbot liver).

Data received from these analyses will strengthen our expanding dataset, and will be very valuable in investigating whether contaminant levels in fish are changing over time, and whether contaminant levels differ among locations.

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Location: Mackenzie River Delta

Mercury input to the Beaufort Sea from the Mackenzie River

Levels of toxic monomethyl mercury (MeHg) in the tissues of marine mammals living in Canada’s Beaufort Sea can be high. MeHg contamination of these mammals may come from several different sources. The Mackenzie River (MR) is one potential source of mercury (Hg) to the Beaufort region. It is not known how much Hg is delivered from the MR each year. The research team have been sampling surface waters from the lower MR and its delta channels for total Hg (THg; all forms of mercury) and MeHg. In 2010, surface water samples were collected from the two largest rivers entering the MR delta (MR and Peel River), one mid-delta site (MR at Horseshoe Bend) and two large channels exiting the MR delta (Reindeer, Middle Channel at Langley). Samples were taken from inflow rivers 14 times between May and September 2010. Mid- and lower-delta sites were sampled during 5 helicopter surveys throughout May 2010. Three delta lakes were also sampled 4 times in June 2010. All 2010 water samples have been analyzed for THg and MeHg levels. Other University of Alberta researchers are working on determining how much water flows through the MR delta every year. The research team will use their water flow information with our THg and MeHg levels in water data to generate estimates of how much THg and MeHg enter the Beaufort from the MR every year.

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File Number: 12 402 780
Region(s): SA

Licence Number: 14803
Location: Lac St. Therese, Kelly Lake, Doctor Lake, Lennie Lake, Mahoney Lake, Turton Lake, Man Drowned Himself Lake, Stewart Lake, Hodgson Lake and Sam McRae Lake

Baseline mercury levels in predatory fish in the Sahtu Settlement Area

Three teams of two people collected fish with gill nets of varying size in six lakes. The teams were made up of local people from three communities, including Norman Wells, Tulıt’a and Délı̨nę. The Norman Wells team set nets in Hodgson (Jackfish) Lake, Lennie Lake and Kelly Lake; the Tulıt’a team sampled Stewart Lake and Tate Lake; the Délı̨nę team sampled Lac Ste. Therese. Each lake sample consisted of a minimum of 20 fish, representing three age/length classes that were used to determine bioaccumulation rates within each population. Total mercury in tissue analyses were performed by Flett Research Ltd., Winnipeg, Manitoba.

The four target fish-eating species included lake trout, walleye, northern pike, and inconnu. Harvests focused on one major fish type known to occur in abundance in each lake. All additional fish that were harvested were curated for future studies. This project provides current information about the health of some subsistence predatory fish in six lakes that are commonly used by residents of the Sahtu Settlement Area. A final report outlining the results will be completed by March 31, 2011. The SRRB will facilitate public meetings in all five Sahtu communities, with the assistance of the GNWT Department of Health and Social Services, and will provide plain language handouts that explain the results of the study with respect to each community. This investigation may help to identify alternative sources of fish from lakes not impacted to the degree seen in Kelly Lake and Lac Ste Therese.

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Licence Number: 14770
Location: The abandoned Panarctic Satellite F-68 well site is located at Satellite Bay on the north-western coast of Prince Patrick Island

Talisman Energy Inc. abandoned Panarctic Satellite F-68 well site contamination Delineation program

Talisman Energy Inc. conducted a debris consolidation and Phase II Environmental Site Assessment (ESA) program at the abandoned Panarctic Satellite F-68 well site area at Satellite Bay on Prince Patrick Island, Northwest Territories. Panarctic Satellite F-68 was a dry exploratory petroleum well drilled in the 1970s.

Several areas of potential environmental concern were identified around the well site. These included the well site area itself, a small lake containing old steel fuel drums, a landfill area, debris areas, areas of surface stains, potential buried (likely detonated) explosives, an area of suspected buried debris and miscellaneous debris areas.

During the debris consolidation work, the debris was manually consolidated into bags of wood, scrap metal, batteries, glass and other debris, and piles of wood, metal, debris and 45-gallon steel drums. The Phase II ESA included a geophysical survey, testing for liquids in the drums from the lake, and surface water, groundwater and soil sampling. Samples were submitted to an accredited laboratory for analysis, and compared to applicable territorial and federal guideline criteria (residential / parkland). Numerous exceedances for metals and petroleum hydrocarbon parameters were identified in the sampled soils, surface water and groundwater. Impacted areas were identified and additional sampling is required to delineate contaminated areas.

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Licence Number: 14780
Location: Canol Trail

Environmental sites assessments, Canol Trail, NT

SENES Consultants Ltd. and Franz Environmental Inc., in association with Willow Lake Environmental Ltd., undertook Phase II Environmental Site Assessments at sixteen sites located along the Canol Trail. A detailed site survey of the sixteen sites was completed from July 19 to August 5, 2010. The survey consisted of an inventory and evaluation of the buildings, waste debris and dump sites, as well as site characteristics and potential source areas for contamination.

The historical development and use of the Canol Trail has left a variety of buildings in various states of disrepair, along with a large number of drums, dump sites, abandoned vehicles and contaminated soils.

Petroleum hydrocarbon were generally associated with fuel handling areas or pipeline spills. Metal impacted soils were generally found within metal debris/dump areas and drum caches. PCBs, pesticides and glycols were not detected in soils. Asbestos-containing materials were found in vehicle brake pads, gaskets, roofing material and wall board. Most of the wooden structures were unpainted; however painted surfaces typically reported elevated lead concentrations and non-detectable levels of PCBs. Although drum piles are found throughout the trail it was estimated that only 5-10% of the drums contained a fuel/water mixture.

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Region(s): IN
Location: Hendrickson Island

Linking neurochemistry to contaminant exposure in belugas of the Mackenzie Delta
The objective of this study was to see if higher levels of brain mercury were related to changes in brain chemistry and animal behaviour, as observed by Inuit hunters. Our studies have not revealed any systematic effects of mercury on beluga neurochemistry or behaviour.

There were no obvious differences in the behaviour of animals with higher versus lower levels of brain mercury. Whales with higher levels of mercury were not observed to be harpooned more quickly than animals with lower mercury levels. Mercury concentrations in the brains of belugas were higher than concentrations measured in the brains of polar bears. Mercury concentrations were between 0.02 and 30.93 mg/kg (wet weight) in belugas, compared to an average concentration of 0.09 mg/kg (wet weight) in polar bears from Greenland. Although mercury concentrations were quite high in beluga brains, most of the mercury was in a form that is believed to be less harmful than the form of mercury found in polar bears brains. Preliminary results also showed that there may be subtle variations in the transcription (copying) of some genes related to mercury exposure. The research team did not find that the activity of one brain enzyme studied (monoamine oxidase) was affected by brain mercury concentrations.

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Region(s): NS
Location: Kam Lake, Meg Lake, and Rat Lake, Yellowknife

Arsenic speciation in Yellowknife lakes during spring bloom
Water and sediments were collected using Van Dorn samplers, Ponar grabs (for sediments) and corers. Pore water samples were obtained by syringe or centrifugation, while plankton was sampled using a variety of methods (large water samplers, filters and nets). Water conditions (pH, temperature, conductivity, dissolved oxygen, among others) were measured using meters. Because the exact time of maximum productivity cannot be known or predicted in advance, the research team collected samples

throughout 3 weeks in June. None of the sampling procedures were invasive, nor were significant amounts of samples collected. Analyses were carried out using a combination of chromatography, spectrometry spectroscopy at research facilities.

Plant sampling involved collecting small amounts of plants that were judged to be food sources for hare, either by reading the scientific literature or by asking local guides. Small amounts of soil were collected from plant sampling locations. The same analytical methods were used as for the lake study.

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Region(s): NS
Licence Number: 14777
Location: Giant Mine Site

The role of aquatic and terrestrial vegetation in controlling the mobility of arsenic and other metals in northern environments

Previous studies have found that the water and sediments of Baker Creek are heavily contaminated with arsenic, due to extensive physical and chemical loading over the course of the mine's life. It is also believed that arsenic will continue to be added to the creek in the future. In this study, cattail plants and sediment were collected near the mouth of Baker Creek, to see if the plants had any effect on the amount of arsenic in the sediment. It was found that the highest concentrations of arsenic were measured in the black, plant-rich sediments of the marshy region nearest the parking lot, with less (but still significant amounts) being measured in sediments from faster-flowing regions with less plants. Orangey-red regions on cattail roots were also commonly found to be high in arsenic. The results suggest that cattails are important in trapping arsenic, and do so by both physically trapping fine sediment particles with their roots, and chemically through oxidizing the surrounding sediment and producing an iron-rich orangey-red colouring on their roots, which is able to trap arsenic under favourable conditions. A more detailed vegetation and sediment survey is recommended, to determine the extent of the highly contaminated areas.

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Region(s): NS, SS
Licence Number: 14779
Location: Blanchet Mine; Copper Pass Mine; DeStaffany Mine; Outpost Island Mine

Great Slave Lake area mines: site assessment and remediation planning

The objective of the Great Slave Lake mines site assessment program was to assist Indian and Northern Affairs Canada (INAC) with its ongoing work to clean up abandoned mines across the Northwest

Territories. Outpost Island Mine, Blanchet Island Mine, DeStaffany Mine, and Copper Pass Mine are four sites at which environmental site assessments (ESAs) were conducted on 4-15 July 2010.

Phase III supplementary ESAs were conducted at the Outpost Island and Blanchet Island Mines, with results used to fill gaps from previous assessments. Samples of soil, vegetation, water, sediment, benthic invertebrates, and waste rock/tailings surrounding the mines were collected, as well as background environments (where applicable). The results indicate that both Outpost Island Mine and Blanchet Island Mine require some level of remediation, with an ESA report being drafted. Remedial action plans will be completed next year.

Phase II ESAs were carried out at the Copper Pass and DeStaffany Mines. Results will be reported in an ESA report that is being produced. Soil, surface water, sediment, waste rock/tailings, and any possible contaminant sources were sampled within the mine areas, as well as background conditions. Results identified potential contaminant sources and areas requiring further assessment. Theses results will be used to create a work plan for a detailed Phase III ESA, and later, a remedial action plan. Results of the ESAs at the four mines will be provided to INAC for distribution.

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Location: Ruth Lake; Bullmoose Lake

Seven mine site project

The objective of the Ruth and Bullmoose site specific risk assesments (SSRA) were to evaluate whether contamination of the terrestrial and aquatic environments from historical mining activities has the potential to pose unacceptable risks to human and ecological receptors that might spend time at the site.

The results of the Ruth SSRA demonstrate potential risks to humans, largely due to arsenic exposure. Ingestion of soil and drinking water were the primary sources of direct exposure for humans. Potential risks for wildlife were also identified; terrestrial plants, invertebrates, shrew and muskrat may be exposed to arsenic in soils and sediments, while shrew may also be exposed to iron in soils. An assessment of fish indicated negligible or low risk for fish exposure to contaminated sediments and surface water in Tam Lake.

The results of the Bullmoose SSRA also demonstrate potential risks to humans, largely due to arsenic exposure. Ingestion of soil and drinking water were the primary sources of direct exposure for humans. Potential risks for wildlife were also identified; terrestrial invertebrates, aquatic invertebrates and muskrat may be exposed to arsenic in soils/tailings and sediments, while terrestrial and aquatic plants and invertebrates, shrew, grouse, hare, loons, mallard ducks,and muskrats may be exposed to iron in soils/tailings and sediments. An assessment of fish indicated moderate to high risk for fish exposure to contaminated sediments and surface water in Bullmoose Lake.
A detailed remedial program that accounts for the results presented in the Ruth and Bullmoose SSRAs has been proposed, and is currently under review.

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Licence Number: 14790
Location: Peg Tantalum; Mitchell Lake Mine; Stark Lake; Courageous Lake; Great Bear Outfitter Lodge

Combined phase I/II ESAs for five sites

The objective under this licence was to conduct a phase I/II environmental site assessment (ESA) of the Peg Tantalum Mine, Mitchell Lake Mine, Stark Lake Mine, Courageous Lake Gold Exploration Camp and Great Bear Lake Outfitter Lodge sites, to determine current environmental and physical conditions and allow for the development of appropriate remediation strategies. Historical records were reviewed, sites were mapped by GPS, and significant features were catalogued, as part of the phase I ESA. Soil, sediment, and surface water samples were collected from areas of potential environmental concern and analyzed for constituents of potential concern, as part of the phase II ESA.

Soil data at the Peg Tantalum Mine suggests that shallow soils in debris areas, the mill area, and beneath old machinery and drums contain elevated levels of constituents of concern and are above applicable guidelines. Since there was limited soil present above bedrock, it was assumed that these are limited, localized impacts.

Sampling data at the Mitchell Lake Mine site suggests that impacts on soils, sediments, and water are largely from metals. Areas of concern at the Stark Lake Mine were associated with the former camp and buildings. These areas of concern were defined as shallow, localized impacts. Other areas, which contain waste rock piles, were defined as potential watershed-wide issues and may require active containment or control, in order to limit risks to the environment and to manage possible radiation exposure.

Areas of impacted soils were noted in the former drum cache/burn pit at the primary camp at Courageous Lake, and beneath the additional drum cache north of the camp.

Areas of concern at Great Bear Lake Outfitter Lodge were generally related to drum/fuel storage, hazardous building materials, former powerhouse, and scattered wastes. Where observed, the fuel caches were small and impacts appeared to be limited. Fuel impacts to soils were observed to be deeper and spread over a larger extent at the former powerhouse.

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Region(s): NS

Licence Number: 14772
Location: Consolation Lake Mine; Beaulieu Mine; Strike Lake Mine; Chipp Lake Mine; Spectrum Mine

Environmental site assessments at five abandoned mines

EBA Engineering Consultants Ltd. (EBA) was retained by Public Works and Government Services Canada in May 2010 to conduct a Phase III environmental site assessment (ESA) at the following mines:

- Beaulieu Mine
- Chipp Mine
- Joon Mine (Strike Lake)
- Spectrum Mine
- Storm Mine (Consolidation Lake Mine)

The mines are located approximately 70 km east of Yellowknife, NT. The Phase III ESAs were completed so they could be added to the draft remedial action plan (RAP) for two additional mines (Bullmoose and Ruth Mines), which EBA assessed in 2009.

The results of the Phase III ESA showed that there are multiple areas of contamination at the five mine sites. The main contaminants of concern are arsenic, mercury, lead, nickel, copper, selenium, and limited areas of hydrocarbons. The remedial action plan will include remediation of hazardous materials, non-hazardous materials soil, tailings, surface water, sediments and waste rock. In addition to the Phase III ESA reports, preliminary quantitative risk assessment (PQRA) reports were produced for the Beaulieu Mine and Spectrum Mine, in order to evaluate both the ecological and human health-based risks posed bytailings, sediments and surface water identified at these mine sites.

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Location: Narrow Lake, Winter Lake, Round Lake, Nicholas Lake

Yellowknife gold project 2010 hydrometeorological survey

Tyhee NWT Corporation has conducted baseline environmental studies on its Yellowknife Gold Project site, as part of the development of a gold mine in the area. In 2004, EBA Engineering Consultants Ltd. began the hydrology and meteorology baseline studies for the Yellowknife Gold Project.

During 2010, only a single hydro-meteorological field survey was conducted. The trip was in early June to inspect the hydrometric stations, reinstall the stage recording instruments and measure lake outlet discharges. The evaporation pan was reinstalled and maintenance of the meteorological station completed during this site visit. From June to September 2010, creek stages were measured and recorded every 15 minutes for Round, Winter, Narrow and Nicholas Lake outlet creeks. During the site visit, new stage discharge data for the four outlets were collected to augment the existing stage discharge curves. Over this same period instrumentation was installed to monitor lake levels, which were measured every 15 minutes and recorded for Round, Winter, Narrow, Nicholas and Giauque lakes. The onsite meteorological station, installed in 2004, continues to record wind speed and direction, air temperature, precipitation, relative humidity and barometric pressure. Pan evaporation data was also measured daily at 7:00 AM, between June and September 2010.

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Region(s): NS, SS
Licence Number: 14731
Location: Thor Lake

Baseline studies for Avalon Rare Metals Ltd. proposed Thor Lake rare earth metals project - surface water hydrology & groundwater

The objective of this research was to characterize the surface water hydrology and meteorological conditions at the Thor Lake site. Other objectives included describing the hydrogeologic and hydrostratigraphic units, measuring the occurrence of groundwater, and sampling and analysis of the groundwater chemistry at the Thor Lake site.

Field work in 2010 included water level monitoring in Thor, Long and Cressy lakes. Water levels were recorded using Hobo pressure transducers and water level gauges secured to the lake or stream bed. Stream flow was monitored at the outlets of Thor, Long, Fred and Murky lakes following standardized methods in May and October.

Meteorological conditions were monitored at the Thor Lake site using a weather station. Data were periodically downloaded and compiled; station maintenance was also completed at these times. Other 2010 field work included monitoring groundwater levels and sampling groundwater quality in monitoring wells installed in previous years. Groundwater levels were monitored at all wells in May, June, September and October. Samples were retrieved from some monitoring wells, while ice bridges in other monitoring wells limited the recovery of groundwater samples.

Lake water levels, stream flows, and meteorological data will be compiled, analyzed and compared to regional data, while groundwater elevations and groundwater quality results will be tabulated.

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Licence Number: 14727
Region(s): DC
Location: N'dulee Crossing, Mackenzie River

In-stream turbines for N'dulee Crossing ferry camp

There are a large number of small enterprises and communities that currently require the use of diesel or gas generators to provide electricity. As many of these are situated on rivers, the potential for hydrokinetic power generation is relatively large. The benefits of displacing diesel are both economic and environmental. In-stream turbines are especially attractive, since they do not require modification to the water flow, in contrast to runoff-the-river hydro and dams.

A small turbine, mounted on a boat, is rotated by the river current. A power generator atop of the turbines converts the mechanical energy of the rotation to an electrical current. The following is a technical description in plain language, as much as possible. A 5 kW turbine, of diameter 1.5 m and height 1.5 m, captures between 35% and 40% of the energy in moving water. The turbine rotates at a very slow speed, about 2 to 2.5 times the speed of the water flowing through, translating to approximately 90 RPM.

The turbine will be mounted on a pontoon boat. A boom deflector will be inserted into the river and anchored to the river bottom by means of a cement block. The boom deflector will carry a large buoy, a safety beacon, chain rails and warning signs. The pontoon boat will be maneuvered downstream and just behind the boom by a second boat. The pontoon and the turbine will then be anchored to the boom. A slack safety cable would also be attached to the floating structure and run to shore. This ensures that if the anchor or anchor cables fail that the floating structure will float to shore downstream. The electrical wires that connect the turbine generator to an on-shore inverter are attached to the safety cable. Once the electrical connections will be completed, the turbine will be rotated into the water and allowed to spin and generate electricity.

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File Number: 12 406 057	**Licence Number:** 14738
Region(s): IN, GW	**Location:** East Channel of Mackenzie River, within Municipal boundaries of the Inuvik.

Renewable energies: design and testing zero-head micro hydro turbine, solar/hydrogen fuel cell testing

Research on renewable energies (e.g. design and testing zero-head micro hydro turbine, solar/hydrogen fuel cell testing) has been going on since licensing. Substantial literature review was undertaken. Theoretical conceptualization of the tool that will be used to tap the energy from a slow flowing river has been developed based on theoretical mechanics. A table model of the tool has been made, thus completing the first step of this research. Next, design work using AutoCAD will be undertaken to facilitate fabrication, product simulation and testing.

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File Number: 12 406 054	**Licence Number:** 14965
Region(s): NS	**Location:** Selected lakes and adjacent areas along the length of the Tibbitt to Contwoyto Winter Road

Paleoclimatological assessment of the central Northwest Territories: implications for the long-term viability of the Tibbitt to Contwoyto winter ice road

In support of our three-year multi-disciplinary research project, 80 sediment/water interface samples from 43 lakes along the route of the Tibbitt to Contwoyto Winter Road have thus far been analyzed for water property data (e.g. pH, conductivity), substrate characteristics (e.g. LOI, grain-size, BSi), nutrient loading, water geochemistry (e.g. F/U, Fe/Mn, DIC/DOC) isotopes (C/N) and environmentally available metals. This data is being used to develop training sets and transfer functions based on micropaleontological proxies (e.g., thecamoebians, diatoms and chironomids). Twenty-one Glew cores and 16 freeze cores have also been collected from these lakes. Use of a freeze core microtome has permitted subsampling of freeze cores to mm-resolution (2-5 years). Preliminary time series analyses results indicates that throughout the late Holocene there has been considerable climate variability with winter and summer signals often becoming decoupled. The Pacific Decadal Oscillation and North Atlantic Oscillation have contributed to step-wise temperature changes, as these phenomena vary between positive and negative phases. There is also a correspondence between solar cycles and seasonal climate variability with solar cycle peaks corresponding to cooler summers and warmer winters, and troughs corresponding to warmer summers and colder winters. The first scientific papers resulting from the research are in preparation.

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Region(s): IN, GW, SA, DC, NS, SS **Location:** All NWT

Should newborn screening be initiated in the Northwest Territories for mild CPT1 (Carnitine Palmitoyl Transferase-1) deficiency?

This study is now complete. As previously described, newborn screening blood spots were tested for for the P479L variant of CPT1 in all babies born in NWT in 2006. This study revealed that 3% of the test population were homozygous (had two copies) for the variant. However, within the Inuvialuit, 21% were homozygous for P479L. The higher homozygosity in the Inuvialuit suggests a possible historical advantage. High P479L homozygosity has also been seen in Inuit, Alaska Native and coastal BC First Nations populations.

There were 16 cases of unexpected infant death documented in NWT from 1999-2008. Of those, 7 samples were available for testing (3 Inuvialuit, 3 First Nations, and 1 non-Aboriginal). Within those 7 cases, the P479L variant was only present in the Inuvialuit cases, 2 were P479L homozygous and 1 was P479L heterozygous (had copy of the variant). All other cases were normal. The number of cases in the Inuvialuit was too small to assess risk, however, our data for Nunavut suggests that there may be an increased risk of unexpected infant death to those infants who are P479L homozygous. Discussion regarding public health measures are on-going and may include education programs for health professionals and families about the possible risks associated with the variant.

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Region(s): IN, GW, SA, DC, NS, SS **Location:** All NWT

Surveillance and cost analysis of respiratory syncytial virus infections in arctic communities in Canada

The Northern RSV surveillance began in January 2009. The sites included Yellowknife (Stanton Regional Hospital) as well as 3 other sites in arctic Canada, 4 children's hospitals in the south, and multiple sites in Greenland. Although the study is going well, there have been challenges in coordinating numerous sites and there have been some delays in receiving completed data forms.

To date 428 children have been enrolled from the Canadian sites (249 prospectively and 179 retrospectively), of which 105 were from Stanton Regional Hospital. Of these 105, 100 had at least one laboratory test. RSV was identified in 38 of these cases; in 30 cases it was the sole virus and in 8 cases

RSV was present with another virus. All children will have further testing. Enrollment is closed and the research team is currently in the process of completing final analyses.

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Region(s): NS **Location:** Aurora College, Yellowknife campus

Evaluating concept mapping as a teaching strategy to promote meaningful learning in clinical practice with baccalaureate nursing students

Concept mapping is a tool used by nursing faculty to assess and evaluate students' knowledge, critical thinking and decision-making in clinical practice. Concept mapping has been utilized for several years in our baccalaureate nursing program. A recent evaluation study using qualitative and quantitative methods provided validation for use of this tool; 41 nursing students and 9 nursing faculty participated in this research. Nursing students in year one, two and three completed concept maps weekly during a six week nursing practice course. The concept maps were scored at midterm and final. A paired t-test indicated a significant increase in concept map scores for Year 1 only. Students also completed a 10-item evaluation questionnaire. Overall, the students' average response indicated they were satisfied with concept mapping. They indicated that concept mapping helped most with showing relationships and interrelationships. Students neither agreed nor disagreed that concept mapping contributed to their critical thinking and decision making. They did, however, disagree that scoring the concept maps was beneficial to their learning. Overall, concept mapping was viewed as positive by nursing faculty at a designated group meeting. Faculty indicated it was effective in helping students identify salient data, make connections, view a holistic picture of the client, show their knowledge on paper and engage in dialogue and inquiry. Some challenges included scoring the concept maps, reviewing the concept maps without the student being present, and the time involved to learn and evaluate concept mapping. Concept maps scores significantly increasing in year one brings into question the value of scoring concept maps for year two and three students. Faculty also viewed scoring as not beneficial. This required further exploration. Recommendations from this study were to keep concept mapping as a teaching/evaluation tool in instructor-led groups, have scoring as optional for students and faculty, and link concept making to the curriculum decision-making framework.

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Examining DNA fingerprinting as an epidemiology tool in the Northwest Territories

This population-based retrospective study examined the DNA fingerprints of all laboratory confirmed cases of tuberculosis (TB) in the Northwest Territories (NWT), Canada, between 1990 and 2009. An isolate of each lab-confirmed case had genotyping done using IS6110 Restriction Fragment Length Polymorphism (IS6110-RFLP). DNA patterns were assigned to each DNA fingerprint and indistinguishable fingerprints patterns were assigned a cluster. Trend analysis using chi-square and correlation studies using odds-ratio were used to examine the demographics, risk behaviour, and clinical aspects of the major DNA fingerprint clusters. Social Network Analysis (SNA) was used to examine direct linkages among cases through conventional contact tracing (CCT), their DNA fingerprint, and community. Eight clusters were found among 195 cases. Clustering was associated with risk factors of unemployment, excessive alcohol consumption, homelessness, and previous exposure to a case. DNA fingerprinting and SNA can be additional epidemiological tools, along with CCT, to determine transmission patterns of TB.

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Region(s): IN, GW **Location:** Inuvik

Climate change and food security among at-risk populations in regional Inuit centres
This research will document and describe the nature of food insecurity of at-risk populations in Inuvik using photovoice to facilitate semi-structured interviews and focus groups. The characteristics (i.e. age, sex, employment history, length in community, health status, family characteristics, etc.) will be documented. The role of store foods, traditional foods, food networking and food sharing will be assessed to determine the vulnerability of Inuvik's food systems to climate change. The interviews and focus groups will also analyze the historical changes in climate and the resulting affects on food security experienced in Inuvik.

Visits were made to the Inuvik Homeless Shelter Manager and the Inuvialuit Regional Corporation, and a presentation was made to the Inuvik Interagency Committee to discuss the project. Researchers from McGill University and the Institute for Circumpolar Health Research conducted a photovoice workshop at the Inuvik Works facility with seven local participants. The participants had responded to advertisements displayed in the Food Bank, Homeless Shelter and other areas of Inuvik. The focus groups were followed by in-depth interviews with each participant where data was collected. The in-depth interviews continued until the end of November with other community members in Inuvik. Data analysis has begun.

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Region(s): IN **Location:** Paulatuk, Sachs Harbour, Aklavik

Healthy Foods North - experience and training for northerners

Through an integrated, multi-level, multi-component community-based approach, Healthy Foods North aims to reduce the risks for chronic disease by working in partnership with communities to develop, implement and evaluate culturally appropriate community-based intervention programs. These programs are aimed at improving diet, increasing physical activity and providing education concerning lifestyle choices. The research and evaluation components of this project include gathering a variety of data specific to healthy lifestyles and food security (i.e. socio economic indicators), as well as documenting community and partner participatory approaches. In order demonstrate to communities, partners and funders that Healthy Foods North has improved diet, increased physical activity and created sustainable, supportive environments, impact of the program are measured through a variety of methods at the store, community, and individual levels. Process evaluation measures are used to assess levels of implementation, while data is also collected before and after program components to assess changes in psychological factors, behavior, such as dietary intake, and health outcomes.

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Licence Number: 14668
Location: Dehcho HSS Authority, Fort Smith HSS Authority, Hay River HSS Authority, Sahtu HSS Authority, Stanton Territorial Health Authority, Tlicho Community Services Agency and Yellowknife HSS Authority

Do tailored messages promote evidence-informed decision making in breast cancer prevention?

No research was conducted under this licence.

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Region(s): IN

Licence Number: 14709
Location: Hospital in Inuvik and health centres in Aklavik, Ulukhaktuk, Tuktoyaktuk, Sachs Harbour and Paulatuk

Medical chart review for the Inuit Health Survey: health in transition and resiliency

The Inuit Health Survey (IHS) was conducted in the Inuvialuit Settlement Region in 2008 in response to Inuit requests to better understand the factors contributing to health, health transition, and the Inuit spirit of thriving and resiliency in the face of changes. The medical chart review was part of the IHS and took place in 2010 in Aklavik, Inuvik, Tuktoyaktuk, Sachs Harbour, Paulatuk and Ulukhaktok. A nurse reviewed the medical charts of those who agreed to participate to verify if heart disease, diabetes and related chronic medical conditions were present prior to their participation in the Inuit Health Survey so that any chronic disease developments could be documented.

362 Inuvialuit participated in the Inuit Health Survey in 2008 and 347 (95.8%) agreed to have their medical charts reviewed. A total of 343 medical charts were reviewed while 4 charts could not be located. The information from the chart review was not to be communicated to individuals or communities as each participant already receives care from their local health providers. The medical chart review information was added to our existing database and will form baseline information for the international cohort to better evaluate factors that protect from, or increase the risk of, chronic disease progression.

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Leadership qualities required to effect positive transformational change in telehealth implementations

This project identified the leadership qualities that are essential to effect positive transformational change, specifically for the implementation of telespeech language pathology services in the Northwest Territories (NWT) health care system. The successful NWT TeleSpeech Language Project, a territory-wide project designed to deliver speech language pathology services from regional health care centres into community schools, was the focus of the research. Project implementation staff, including speech language pathologists, education staff, technical staff, and project staff of various ages and genders, participated in a focus group. The findings related to communication, relationships, collaboration, champions, consistency, and innovation. The four conclusions derived from the research include the following: telehealth project implementations staff require good communication skills; telehealth implementations require collaborative relationships; it is beneficial to have project advocates at all organizational levels of telehealth projects; and telehealth implementations require staff and organizational willingness to be innovative.

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Region(s): IN, GW **Location:** Aklavik

The Aklavik H. pylori project

The Aklavik H. pylori project has been conducted with guidance from the Aklavik Health Committee. Since November 2007, 379 participants have enrolled, 333 have had a breath test for H. pylori infection and 58% of those tested were positive. In February 2008, 194 completed a scope test and had stomach biopsies taken. The doctors who did the scope tests observed that 3% had stomach ulcers and 14% had inflammation in the stomach. The pathologist who examined the biopsies observed that 67% had H. pylori, and among those with H. pylori, 43% had severe inflammation and 20% had damaged glands (atrophy). This level of severe inflammation of the stomach is much higher than that observed in Edmonton. The prevalence of H. pylori infection is higher among those who had a scope test because participants who had positive breath test results were more likely to have the scope test. Since April 2008, 286 participants and 145 households have completed epidemiology surveys. In 2008, 111 participants with H. pylori infection enrolled in a treatment trial and 87 have had a breath test after treatment to see if the treatment worked. A documentary was created to communicate the results of the project with the community.

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Region(s): IN **Location:** Aklavik and Ulukhaktok

Changing the "culture of smoking": community-based participatory research to empower Inuvialuit communities

This community-based participatory research (CBPR) project began in Aklavik and Ulukhaktok in 2007. CBPR team members completed baseline surveys in late 2008. Local teams completed data entry during early 2009, and data have now been checked and analyzed. Shortly, local teams will share a summary of baseline survey results with their communities.

During late October and November 2010, project teams – mainly youth – were oriented about tobacco reduction using the "Smoking Sucks" resources. As well, they were trained in how to implement a door-to-door smoke-free homes survey. At the same time as doing the survey, the youth handed out flyers about second-hand smoke, and invited people to sign up for a Be Smoke-free Challenge. The surveys were completed in November, and the results have already been analyzed and shared with the communities. There was an excellent response rate with very few refusals. The main findings were that 94% of people in both communities had heard of the term "second-hand smoke". More people in Aklavik could correctly explain what the term means (48% vs. 36%), however, this knowledge does not necessarily translate into commitment to keeping a smoke-free home. More people in Ulukhaktok reported that no-one smokes inside (82% vs. 51%).

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Region(s): SA, IN, GW, SS, DC, NS **Location:** NWT-wide

Analysis of NWT medevac and medical travel system
In 2010, preliminary discussions were held with the department of Health and Social Services about using existing data sources related to medical travel. The responses have been highly favorable. It is hoped that data can be secured in 2011 so that statistical analysis can begin.

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Region(s): IN, GW, SA, DC, NS, SS **Location:** NWT-wide

Influenza A H1N1 (swine flu) ICU study
On June 11, 2009, the World Health Organization (WHO) declared the worldwide A/H1N1 pandemic. The Canadian Critical Care Trials Group (CCCTG) responded rapidly by developing a multicentre observational study, engaging 82 intensive care units (ICUs) located across all regions in Canada. Data was collected from 1000 critically ill A/H1N1 infected adult and pediatric patients.

The ICU-Flu study concluded that:
- H1N1 caused severe illness, predominantly in young adults and children.
- Up to 20% of those with severe illness will die, but without adequate life-supporting care the mortality rate is likely to be much higher.
- Children and adults with co-morbid conditions and pregnant women are at risk of severe illness.
- Vaccination is a cost-effective strategy to prevent illness.
- Antiviral therapies may be effective treatments for the most ill of patients.
- Extraordinary means of oxygenation support may be life-saving for this patient population.
- Aboriginal Canadians did not appear to be at increased risk of severe illness or death when both waves of H1N1 in Canada were examined.

Our studies exploring the effect of high dose antiviral medications, corticosteroids and statins in treating severe influenza are ongoing.

The rapid spread of the A/H1N1 virus demonstrated the need for full knowledge of the Canadian capacity to treat severe disease and how to focus care in the event that capacity is breached. The ICU Capacity Study surveyed every hospital in Canada, resulting in an inventory of Canadian critical care capacity that includes the location of all ICUs, the number of ICU beds, the number and types of all ventilators and specialized oxygenation devices, and the ability to perform advanced life-support therapy. Defining capacity, in terms of geography, population density and distance to care, will assist with policy decisions, regarding the optimal use of limited resources during a pandemic and how to augment this capacity according to need.

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Region(s): NS **Location:** Behchokò, Gamètì, Wekweètì, Whatì, Yellowknife

Tlicho Natsedzi Nihtsi: Tlicho healing wind project / promoting sexual health
The Tlicho Healing Wind Project's main objectives are to build a sustainable research base to inform tracking of sexually-transmitted infections (STIs) across the region, guide the development of preventive sexual health programs and policies, build research capacity, and strengthen regional networks between health care professionals and educators.

During 2010, the Community Action Research Team (CART) completed several training sessions on topics such as qualitative data analysis, survey development and administration, as well as survey data entry, management, and analysis. CART also continues to implement sexual health programming informed by baseline survey results, ongoing focus groups and interviews as well as program evaluation.

The follow up survey was conducted in May 2010, based on community recommendations. Twenty community-based researchers (CBRs) were trained to administer the survey. The survey was targeted to any Tlicho resident 14 years and older and resulted in participation from 36% of the region. The CART organized data entry and management, whereas project partners led the data analysis process. The Healing Wind Advisory Group reviewed preliminary survey findings in early November and their feedback will inform final analysis, outcomes and related interventions. Final survey results will be shared with the Healing Wind Advisory Group early in the new year. Throughout the research and program delivery process, CART and the Healing Wind Advistory Group have continued to strengthen relationships with the four Tlicho regional health centres and other Tlicho Community Services Agency departments, in keeping with our goal of integrated service delivery.

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Region(s): NS **Location:** Behchokò

The viral hepatitis northern : a platform for addressing viral hepatitis in the Canadian north During 2010, study investigators travelled to a large community in the Northwest Territories and performed clinical assessments of patients who had evidence of hepatitis B infection from previous testing in 1984. The infection found in these individuals was unusual, in that the standard test for hepatitis B infection (HBsAg) was negative and yet they still had virus present in their blood. This condition is called "occult HBV infection" or OBI. A total of 7 OBI subjects were seen and approximately 20 additional charts of OBI individuals who were out of the community at the time of the visit were reviewed. Overall, the results were quite encouraging, in that there was no clinical, laboratory or radiologic evidence of advanced liver disease in any of the 27 subjects. Moreover, on retesting, only 1 of the 7 individuals in whom paired blood samples were now available still had evidence of hepatitis B infection. Based on these findings, It is not believed that frequent monitoring, including ultrasounds or liver biopsies, is required and there is no evidence to suggest that treatment with antiviral drugs is required for this type of hepatitis B infection.

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Region(s): NS **Location:** Stanton Territorial Hospital

Aboriginal ethnicity as a risk factor for inadequate analgesia in the emergency department

No research was conducted under this licence.

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Region(s): NS **Location:** Stanton Territorial Hospital

Canadian survey of nurses' assessment and management of pain in the critically ill

Assessment and management of pain presents a significant challenge for nurses caring for critically ill patients who are frequently unable to communicate, due to a decreased level of consciousness, sedative medications, or the use of mechanical ventilators (breathing machines). The research team surveyed nurses working in intensive care units (ICUs) across Canada, in order to evaluate their pain assessment and management practices, and to better understand the perceived barriers and enablers to effective pain practices in the ICU.

Nurses reported they were less likely to use a pain assessment tool for patients unable to communicate than for patients able to self-report their pain. Routine (>50% of the time) discussion of pain scores during nursing handover was reported by the majority of nurses though doctors frequently did not target pain medication to a pain score. Few nurses were aware of professional society guidelines designed to guide pain assessment and management.

Our survey suggests that many ICU nurses do not use pain assessment tools for patients who are unable to communicate and are unaware of pain management guidelines published by professional societies. Results of this survey will enable us to develop strategies for practice improvement and education programs that together will improve patient care.

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File Number: 12 408 182
Region(s): NS
Licence Number: 14826
Location: Stanton Regional Health Authority

Prevalence of MRSA, VRE and C. difficile among adults hospitalized in Canadian hospitals
A total of 173 hospitals (representing 62% of those eligible) with 38,353 inpatients participated in the survey, with representation from every province. 90 (52%) hospitals had 50-200 beds, 72 (42%) had 201-500 beds, and 11 (6%) had more than 500 beds. Almost all (99%) hospitals did routine surveillance for MRSA and VRE. The national prevalence rates of MRSA, VRE, and CDI are summarized in the report. Regional differences in prevalence rates were observed: the prevalence of MRSA was highest in Atlantic provinces; VRE and CDI were most prevalent in British Columbia, Ontario, and Quebec. MRSA, VRE, and CDI were thought to have been healthcare-associated in 79%, 96%, and 84% of cases respectively. 44% with MRSA and 56% of those with VRE were first identified with these organisms during the current hospital admission. CDI patients were older (mean age 76 yrs) than were those with MRSA (70 yrs) or VRE (71 yrs).

Conclusion: These data provide the first national prevalence rates for MRSA, VRE, and CDI in Canadian adult acute-care hospitals. In most cases, the organisms were nosocomial (acquired in hospital). MRSA and VRE were most often identified during hospital screening of targeted high-risk patients or high-risk inpatient units.

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Location: Stanton Territorial Health Authority, Aurora College

An orientation and resource guide for preceptors of nursing students
Research for this project took place in the fall of 2010 and included an extensive literature review and participant interviews. The literature review highlighted the needs of nurse preceptors, nursing students, educational institutions and health organizations. Twelve former students, nurse preceptors, nursing instructors, and nurse managers were recruited and interviewed to determine the knowledge that nurse preceptors and nursing students required to provide safe and competent patient care at Stanton Territorial Health Authority. The participant needs that were identified were similar to those found in the literature. They included a need for preceptors to understand their role and responsibilities and to be aware of the expectations of the student, school, and hospital. These findings validated the purpose of the project, which was to develop an orientation workshop and resource guide for nurse preceptors and nursing students. The participants were also provided with the opportunity to request information they would like included in the workshop and guide. The contents for the orientation workshop and resource guide were based on the research findings. The workshops were delivered in

January 2011. Key topics covered in the workshop included preceptor roles and responsibilities, the scope of practice of nursing students, giving and receiving constructive feedback, nursing program curricula and student evaluation criteria. Formative and summative evaluations indicated the program met the learning needs of both nurse preceptors and students.

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File Number: 12 404 750
Region(s): DC
Licence Number: 14751
Location: Within the Great Slave Lake Plain, north of Fort Providence between Great Slave Lake and the Horn Plateau, from the Mackenzie River to approximately Birch Lake

Lake expansion and wetland flooding on the Great Slave Lake Plain

Where long-term weather records are not available, tree cores can be used to study climate because tree ring growth is often related to local climate, especially temperature and moisture. In 2010, the research team took cores from black spruce trees at five sites where lakes had expanded. Tree growth was most strongly related to the Palmer Drought Severity Index (PDSI), a climatic measure that incorporates both temperature and precipitation variables. Extrapolation of this record suggests that climatic variability is not related to lake expansion, however this relationship may be more complicated than initial analysis suggests. Although black spruce are better adapted for wet environments, they too will eventually produce stressed growth (narrow) rings, and succumb to oversaturated soils and flooding. Environmental changes caused by rising lake levels may be obscuring the PDSI-tree growth relation observed in the earlier growth of the collected samples, and therefore the reconstruction created for this report may be misleading. Recorded precipitation records from surrounding climate stations were inconclusive regarding recent increased precipitation; Hay River appears to be temporally stable, while Fort Providence and Yellowknife have experienced an increase in precipitation. At this point in time, the influence of climate on expanding lake levels cannot be ruled out.

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File Number: 12 404 756
Region(s): GW, NS
Licence Number: 14776
Location: Point Lake, Russell Lake, Damoti Lake, Bell Lake, Rapitan, Yellowknife

Precambrian banded iron-formations: palaeoceanographic, palaeoclimatic, and palaeobiologic implications

Traditionally, investigations about banded iron formations (BIFs) and related sediments have focused on sequences from South Africa, Australia, India and Brazil. Geochemical studies on BIFs from Canada (especially from the NWT), however, are scarce. During summer 2010, the research team conducted strategic sampling at selected sites in collaboration with staff from the Northwest Territories Geoscience Office (NTGO). Fieldwork was partially funded through a grant from the Canadian Circumpolar Institute (CCI Research Grants Program), the Alberta Ingenuity Fund, and NSERC.

Relevant for the written thesis, research is the fact that the geochemical characterization of BIFs from the Northwest Territories will provide further information to understand the atmospheric evolution of Earth, and the chemical composition of the oceans during the Archean-Paleoproterozoic (2500 million years ago), which ultimately lead to the appearance of animal life on Earth. As a result of this work, over 35 samples were investigated by different analytical methods, one abstract was presented at the "Neoproterozoic Sedimentary Basins: stratigraphy, geodynamics and petroleum potential" conference (Novosibirsk, Russia), one abstract will be submitted to the Yellowknife Geoscience Forum, and one paper about the geochemistry of banded iron formations from the Northwest Territories is under preparation.

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File Number: 12 404 670
Region(s): IN

Licence Number: 14658
Location: The specific locations of the offshore field sites will depend upon grounded rubble field formation, and will be determined in early 2010; the chosen location would be approximately 200 km from Inuvik and Tuktoyaktuk or 176 km from Aklavik

Ice rubble generation and its effects on EER systems and ice loading

The field work carried out in the ISR formed part of two integrated research projects carried out over many years, which 1) examined a variety of evacuation strategies for offshore structures in the Beaufort Sea and 2) evaluated and developed methods of engineering ice rubble to reduce loads on offshore structures, therefore enhancing offshore safety.

The objective of the evacuation project was to address the safety of offshore personnel working in Canada's arctic environment by examining issues surrounding emergency evacuation from an offshore structure under the diverse range of conditions in the Beaufort Sea. The project results provided the following: information related to the viability of systems for a range of realistic ice conditions, especially those involving ice rubble; input into the development of the evacuation and rescue options and strategies for Beaufort Sea structures; and can be used by operators and regulators to examine the feasibility of proposed evacuation systems for the Beaufort Sea.

The objective of the second project was to evaluate and develop methods of engineering ice rubble to reduce loads on offshore structures. The research team examined features of naturally occurring rubble piles in the Beaufort Sea and tracked them through satellite imagery, in order to study their formation and deterioration . The conclusions were that, for situations where a caisson-type structure is located in a region of weak, cohesive soil, generating ice rubble through the use of Ice Rubble Generators (IRGs) was both practical and economical. Reducing ice loads on the structure and extending the range of loading that the structure could encounter. There was a significant reduction in structure cost, despite the additional costs of the IRGs, depending on the location.

These results have been disseminated through numerous conference papers and reports. These have been forwarded to the Aurora Research Institute, Inuvik Research Center, and are freely available from the NRC-CHC website: http://www.nrc-cnrc.gc.ca/eng/ibp/chc/reports/reports.html.

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File Number: 12 404 735 **Licence Number:** 14710
Region(s): IN **Location:** Victoria Island

Northern base and precious metal potential, Victoria Island (NWT) and Nunavut

4 X 50,000 scale sheets were mapped, and material necessary for 10 graduate student theses were collected. Our work has clarified the stratigraphy of the poorly mapped area north of Minto Inlet. New aeromagnetic data will be released in November. NNW-trending Proterozoic normal faults controlled melt ascent. One example was mapped in detail, providing insights into the structure and mechanisms of sill-dominated plumbing systems beneath large igneous provinces. The contact metamorphic aureole is unusually wide, and implies significant magmatic throughflow. A series of magnetite (with minor sulphide) skarns is developed in the carbonate rocks that form the roof of the feeder system. The age of Cambrian units has been better constrained by the discovery of Lower and Middle Cambrian trilobites in two units, allowing correlation with units on the mainland. The ENE-trending post-Paleozoic normal faults discovered in 2008 are seen to be widespread and offset stratigraphy and contacts can be seen throughout the map area. The map pattern is controlled to a large extent by this set of faults. An astrobleme with prominent shattercones and a possible impact melt dyke was discovered. A preliminary geological map has been prepared. A second season of mapping is intended for next summer, with a 2 week (approximately) follow-up in 2012.

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File Number: 12 404 679 **Licence Number:** 14653
Region(s): GW, SA, DC **Location:** Near Inuvik , Fort Simpson and Norman Wells

Recent changes in carbon source-sink relationships and greenhouse gas emissions in forest and peatland ecosystems along the Mackenzie Valley region of Canada

The Mackenzie valley region of northwestern Canada has undergone the most warming (1.7 deg C) over the last century in Canada, and general circulation models (GCMs) predict that the region will experience increases in mean annual air temperature of up to 5 deg C by the end of the century. Since relatively large changes in climate are occurring in this region, this project is designed to improve our understanding of the potential impacts of recent climate change on the total carbon (C) storage, source/sink relationships and greenhouse gas (GHG) emissions of forest and peatland ecosystems of the Mackenzie Valley region.

Recent changes in forest and peatland distribution and composition will be assessed across a latitudinal gradient. This study will focus on the point, site and regional scale assessment of C variation in biomass and productivity, C stock estimation, C accumulation rate over the last 50 to 100 years, and the amount and characteristics of GHGs in the Mackenzie Valley. The formation, consumption and thus fluxes of the GHGs (CH_4 and CO_2) from forests and peatlands will be determined. Understanding how these GHGs are produced, and in what amounts, will allow us to understand how they may be influenced by both anthropogenic and natural disturbances. The information will be used to develop a model of C storage and dynamics, in order to predict future impacts of climate change, and disturbances in northern forest and peatland ecosystems.

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File Number: 12 404 748
Region(s): GW
Licence Number: 14749
Location: Mackenzie River delta, main channel, near Inuvik within the Gwich'in Settlement Region.

Flux of sediment-associated chemical elements in rivers draining to the Arctic Ocean

The objectives of this research are to:

- estimate the modern and historical fluxes of sediment-associated chemical elements to the Arctic Ocean;
- understand the relationship of these fluxes to natural and human-induced changes in sediment yields and sediment sources; and
- predict the impact of future climate changes on the fluxes.

This work was carried out by sampling overbank sediments from floodplains/the delta plain in vertical sections, dating sediment sections by Cesium-137, and geochemical analyses of 76 elements at the laboratory of the Norwegian Geological Survey.

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File Number: 12 404 729
Region(s): IN
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Location: Beaufort Sea

O-buoy measurements of ozone, carbon dioxide and bromine oxide over frozen surface of Hudson Bay and Arctic Ocean

The O-buoy instrumentation package is capable of long term measurements of the concentrations of bromine monoxide and two important greenhouse gases (ozone and carbon dioxide) along with a full suite of meteorological parameters, ice drift, sky and ice conditions. One unit was deployed with the help of Canadian United Nations Convention of the Law of the Sea personnel in the Beaufort Sea at 78.18° N and 112.06° W. Data collected between April 3rd and 30th 2010 were transmitted 4 times per day via satellite uploaded to World Meteorological Organization and Arctic Observing Network data and information centres, and displayed on a publically accessible web site. The measured carbon dioxide concentration was within the concentration range recorded by an identical unit over the ice of the Beaufort Gyre. Seven separate episodes of almost complete destruction of ozone were recorded during this short term deployment, indicating the presence of active photochemistry in the area. The number of episodes, their duration and severity are quite different from those observed by the O-buoy unit in the Beaufort Gyre, Alert and Resolute ground stations. The information collected will be used to derive place of origin of these depletions, their temporal and spatial characteristics, along with key mechanisms taking part in their initiation and propagation.

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Region(s): NS
Location: Lac de Gras, NT

Diavik aquatic effects monitoring program 2010

Diavik Diamond Mines Inc. conducts environmental monitoring programs under the terms and conditions of its Territorial Water Licence and Fisheries Authorization. The principal objective of the Aquatic Effects Monitoring Program (AEMP) is to monitor the mine water discharge and other potential stressors from the mine. The AEMP was successfully implemented in 2010. In addition, a fish health survey and a plume Déljnęation survey were completed.

Overall, the 2010 AEMP determined that nutrients (nitrogen and phosphorus) released from the treated mine water discharge are causing mild enrichment in the bay east of the east island. Other results of note from the 2010 AEMP include:

- Dust deposition rates in 2010 were comparable with those measured in 2009.
- The analysis of effluent and water chemistry indicated a low level effect of the mine on water chemistry.
- Results of the sediment analysis did not identify conditions that are likely to affect aquatic life. Although, bismuth and uranium were assigned "high level effects" designations.
- Analysis of benthic invertebrates indicated nutrient enrichment. Results of zooplankton and phytoplankton studies also show a pattern consistent with nutrient enrichment from Mine effluent.
- Phytoplankton (chlorophyll a) and total phosphorus in the near field area resulted in a "moderate" level effect designation. Higher zooplankton biomass near the effluent resulted in a "high" level effects designation.
- The extent of the effluent plume in Lac de Gras was similar between open-water and ice-covered conditions, but concentrations near the discharge point were greater under ice-covered conditions.
- Results from the fish study indicate a pattern consistent with an increased availability of food and nutrients. Despite the moderate-level effects seen in the fish tissue chemistry for bismuth, strontium,

titanium and uranium, there was no evidence that tissue metals concentrations were negatively impacting fish health.

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File Number: 12 404 707
Region(s): IN
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Location: South Melville Ice Cap

Melville Island south ice cap mass balance & snow pollution

Glacier mass balance and snow pollution surveys were conducted on the Melville Ice Cap between April 8 and April 11, 2010. The automatic weather station that resides permanently on the ice cap was still standing, but had been twisted slightly as a result of the wind. The AWS data was downloaded and the instruments lowered, to account for the melting that had occurred the previous summer. Many of the 19 mass balance poles visited required re-drilling, as the relatively cool summer of 2009 left several of the poles from the previous year below the current snow pack. Results from the poles that were found indicated a net glacier thinning of ~305mm over the 2009 mass balance year. This is slightly more negative than the average over the entire 1960-2009 period of record (-211mm), but less than the average of the previous 5 years (-516mm). Glacier mass balance results from the 2010 season indicate cooler than normal 2009 summer conditions relative to those which have occurred across the eastern archipelago region.

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File Number: 12 404 325
Region(s): IN, GW
Licence Number: 14641
Location: Garry Island, Illisarvik, Paulatuk (near the community), Inuvik (adjacent to Dempster Highway near the airport), Red Lake, Bar C, Seal Lake, and Dennis Lagoon

Permafrost and climate change, western Arctic Canada

In 2010 the research team conducted fieldwork in the western arctic in April, July and August. In April the researchers travelled to Illisarvik, and in July and August they visited Herschel Island (by boat), Paulatuk (with Ross Mackay), Illisarvik, and Garry Island.

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File Number: 12 404 754
Region(s): SS

Licence Number: 14766
Location: Little Bear River, Dodo Canyon, Headwaters of Mountain River

Cambrian biostratigraphy in the Mackenzie Mountains, NWT

During our 2010 field season (28 August to 10 September), the research team studied outcrops of the early/middle Cambrian Mount Cap Formation at three localities in the Front Ranges of the Mackenzie Mountains: Little Bear River (64 28.75'N, 126 47.66'W), Inlin Brook (64 16.94'N, 126 32.77'W) and Carcajou Canyon (64 40.24'N, 127 9.75'W). A study of the middle Cambrian Hess River Formation was also attempted, on the west side of the Mackenzie Arch, but was frustrated by an early snowfall. Our principal focus was on documenting the diversity and distribution of trilobites in the Mount Cap Formation. The research team logged cm-scale stratigraphic sections at Little Bear and Inlin Brook and pinpointed the contact between the early and middle Cambrian at both localities; significantly, early Cambrian trilobites (olenellids) had not previously been documented from the Little Bear section. The research team also discovered a horizon preserving abundant Oryctocephalus trilobites, which had not previously been identified in the Mount Cap Formation, and recollected populations of exceptionally well preserved Ovatorychtocara indicus, which is a candidate species for defining the early-middle Cambrian boundary. Our search for Burgess Shale-type microfossils has so far been unsuccessful, though all of the samples have not yet been processed.

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File Number: 12 404 741
Region(s): IN, DC, NS, SS

Licence Number: 14723
Location: Paulatuk, Ulukhaktok, Rae, Fort Providence, Łútsęlk'é

Arctic wastewater research

From May to October of 2010, Environment Canada conducted sampling at wastewater systems in Canada's arctic region for the second year. Extensive sampling, which involved taking samples of influent, effluent, several points in the wetland and sometimes sludge, was conducted at the lagoons in Paulatuk, Ulukhaktok, Fort Providence and Rae. Environment Canada also visited Łútsęlk'é to learn more about the wastewater treatment system there and to take some grab samples.

In Paulatuk and Ulukhaktok, sampling was done just after the spring melt in June and just before the fall freeze up in September. In Ulukhaktok, sludge samples were also taken, and temperature recording devices were left in the lagoon to monitor the temperature over the whole year. Initial results show that lagoon effluent has a lower carbonaceous biological oxygen demand (cBOD5) in the fall than in the spring. The results also show that wetlands contribute to the overall treatment of wastewater, resulting in concentrations below 25 mg/L for both cBOD5 and total suspended solids (TSS) before entering the receiving water. Both Rae and Fort Providence discharge their sewage lagoons annually for 2 to 5 weeks from September to October. In Rae and Fort Providence, samples were collected at the beginning and middle of the effluent discharge. Sludge sampling was also done in Fort Providence. Initial data from both communities show that the lagoon effluent was high in cBOD5 and TSS. The results show that the wetland provided some additional treatment of the wastewater. Community reports containing detailed data are in progress and will be sent to the ARI and the communities by November 30, 2010.

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File Number: 12 404 723 **Licence Number:** 14630
Region(s): IN **Location:** Aklavik, Tuktoyaktuk and Ulukhaktok

Monitoring and surveillance of water borne diseases in the Inuvialuit Settlement Region: adapting to a changing climate in the north

Many of the parameters the research team tested water samples for don't have direct impacts on health, and often standards don't exist. Selected findings from our research are summarized here.

The pH levels were within a normal range. The average conductivity of water samples in the Inuvialuit Settlement Region (ISR) was 474 µS/cm, ranging from 232 µS/cm to 951 µS/cm. The colour of the untreated water was below 5 in most samples (5 is the cutoff for measurement), and 7 in the other 2. The average hardness of the ISR samples was 184mg/L. Fluoride, chloride, sulphate and nitrites were all at levels below the recommended guidelines. The research team tested for 20 different metals. Of these, 16 had established guidelines for acceptable levels. All of the metals with guidelines were either not detected, or detected at levels below the guidelines. Samples were also tested for Polycyclic Aromatic Hydrocarbons (PAHs). Lighter (low molecular weight) PAHs are less toxic to humans and are not carcinogenic (cancer causing). The research team tested for 8 different light PAHs. Several were found, but at very low levels. National guidelines exist for many of these compounds, but are for the protection of Aquatic Life and do not necessarily reflect the potential for causing harm to humans. In two locations, napthalene was found at higher levels than these guidelines. . The research team tested for 10 different heavy PAHs, which are carcinogenic (cancer causing) to lab animals and may be carcinogenic to humans. None were found in the water samples in the ISR. There are no Canadian drinking water standards for Total Extractable Hydrocarbons (TEHs). The only data that was found with respect to TEHs was a report from Iowa that recommends 1,200 µg/L as the level at which corrective action should be taken. Two samples from the ISR had TEHs, but both were only about 10% of the level reported by the state of Iowa to require corrective action (the highest ISR measurement was 180µg/L). No bacteria (E. coli or Salmonella) were found in the samples.

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File Number: 12 404 534 **Licence Number:** 14713
Region(s): GW **Location:** Fort McPherson region

Chronology of thaw flow and geochemistry of associated massive ground ice

The main goal of this project is to determine the distribution, nature and origin of thaw flows and the associated massive ground ice bodies in the Fort McPherson region, Northwest Territories, Canada. This study will use sedimentological analyses and radiocarbon dating to determine the nature and age of sediment in which the massive ice is included. Radardsat 2 images from summer 2009 will be used to evaluate its potential to identify near-surface ice deposits and ancient slump scars at the site. Geochemical, isotopic and occluded gas analyses will be performed on the ice samples to determine their origin. Buried tree trunks in the sediments overlying the massive ice unit will be collected to establish a chronology of past slumping activity using a dendrochronological approach.

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File Number: 12 404 716
Region(s): SA, NS

Licence Number: 14649
Location: Great Bear magmatic zone within 100 km north and 50 km south of Lou Lake, east of Lou Lake, east of Great Bear Lake along a northern Great Bear corridor

GEM Great Bear magmatic zone/iron oxide copper-gold deposit project
A north-south geological corridor that extends from Great Bear Lake to Great Slave Lake has high potential for multiple metals iron oxide-copper-gold (IOCG) deposits, but remains under-explored because of significant knowledge gaps regarding its geological make-up and how to best characterize its mineralising systems. During summer 2010, the Geological Survey of Canada conducted public geoscience research and mapping in partnership with the Northwest Territories Geoscience Office, the Community Government of Gamètì, academia, and the private sector. During the first part of the summer, the project targeted areas east of Gamètì and near Lou Lake and Cole Lake to test new models, techniques, and mapping protocols for IOCGs. Practical skills in geological field data gathering, measurements, and sampling were acquired by First Nations participants. Later in the season, the team moved north to Grouard Lake. From here they conducted helicopter-supported bedrock and surficial materials mapping, as well as sampling for laboratory analysis. Most of this work was conducted in the western North Slave Region, with a few outcrops visited within the Sahtu Settlement Area. Results will be presented at the Yellowknife Geoscience Forum. It will be shown how these results improve the geological framework required for informed, effective, and environmentally viable IOCG exploration in the belt.

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File Number: 12 404 732
Region(s): SS

Licence Number: 14693
Location: At the Second Rapids of the Snowdrift River

Łútsęlk'é hydro power project - 2010 winter monitoring program
The main objective of the Łútsęlk'é Mini Hydro Project Overwintering Fish Habitat Assessment was to determine if overwintering habitat is present at the Second Rapids on the Snowdrift River and to assess the potential effects to overwintering habitat that could result from the proposed hydro power project. A second objective was to collect water quality data at the Second Rapids.

During the assessment, an underwater video camera was used to observe habitat conditions and the presence of fish. No direct fish sampling, in the form of angling, nets, or electroshockers, was used, due to ice conditions and safety concerns at the site. In total, no fish were observed to be at the Second Rapids site and one small isolated section of habitat above the Second Rapids was found to provide viable overwintering potential for fish. Water quality samples indicate that all total metal and nutrient concentrations were below the Canadian Council of Ministers of the Environment standards for the protection of aquatic life.

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File Number: 12 404 737
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Region(s): SA
Location: Lac des Bois

Late Cretaceous marine fauna and paleoenvironment at Lac des Bois, NT

From July 21 – August 6, 2010, our party of four from the Canadian Museum of Nature and the University of Alberta camped on a peninsula jutting out from the western shore of Lac des Bois. The research team searched for the fossil remains of fish and molluscs in the shale rocks and the concretions exposed along the shore. These rocks, now above ground, were once mud at the bottom of a shallow sea about 90-93 million years ago. The fossil bones and shells that were found are the remains of animals that lived in this sea at the same time that dinosaurs were walking along its shores.

85 samples of clam-like molluscs called inoceramids, ammonites, which are shelled invertebrate animals related to squid, and about 150 samples of fish bones were brought back. Some of the fish were only about 7 cm long from head to tail, but parts of a few that would have been a half meter or more in length were found. Most were fairly small and incomplete. The research team found about six different species of fossil fishes; one or two species are probably new – they've never been discovered before, and so are new to science. The new fossil fish species will be described, and the molluscs and ammonites will be studied. Over the next 2-3 years, the plan is to produce several scientific papers on these fossil animals and the ancient environment in which they lived. The specimens will be housed at the Canadian Museum of Nature, the University of Alberta, and the Geological Survey of Canada.

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File Number: 12 404 359
Licence Number: 14735
Region(s): IN, GW
Location: Mackenzie Delta west of Niglingtak Island near Middle Channel, Mallik area of the Mackenzie Delta, Richards Island

Mackenzie Delta shallow gas and permafrost studies

This multi-year project attempts to quantify the release of methane gas from aquatic and terrestrial areas in the outer Mackenzie Delta, with special emphasis on the controls of permafrost and gas hydrates. A highlight of our 2010 field program was the collection of bathymetric and sidescan SONAR data of the stream channels and lakes within our study area, in order to understand the shape of the stream and lake beds. The research team also retrieved four data loggers deployed in 2009, which recorded water temperature, level and conductivity at four lake sites. Two data loggers were deployed to measure the dissolved oxygen in two lakes. Gas discharge was measured at four locations on an unnamed lake (69.2270°N, 135.2422°W) using a custom-made collection funnel. The team were pleased to have two researchers from Deutsches GeoForschungs Zentrum join us in the field, as well as a summer student from the Aurora Research Institute.

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File Number: 12 404 743
Region(s): IN
Licence Number: 14736
Location: Tuktoyaktuk, the outer Mackenzie River Delta and Kugmallit Bay

eSpace - emergency spatial pre-SCAT for arctic coastal ecosystems

Two researchers were in the field between July 21st and July 26th, 2010. Collected videography is currently being analysed to produce a conventional shoreline map that could be used by Environment Canada for emergency response purposes. The classes that will be identified are based on the Primary Shoreline Types of the Canadian North. They will be consistent with those used in the Shoreline Cleanup and Assessment Technique (SCAT), a field survey method used to assess oiling conditions along shorelines.

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Region(s): NS
Licence Number: 14756
Location: Matthews Lake, Courageous Lake, Dumbell Lake, Jolly Lake, Sandy Lake

Courageous Lake project

The 2010 environmental baseline program collected data to characterize the physical and biological setting of the proposed project area.

Air Quality: Dustfall monitoring occurred at five stations every 30 days, over a three month period. The meteorological station at Matthews Creek was maintained.

Noise: Six stations were monitored for 24 hours in summer and fall, coinciding with periods of caribou migration and bird and mammal breeding.

Hydrology: Three hydrology stations were established and monitored throughout the open-water season. Manual velocity measurements were completed at each station.

Hydrogeology: Data loggers were installed on existing thermistor strings. Measurements were collected from thermistor strings.

Aquatics: Water quality was sampled at 13 lakes and 7 streams three times over the summer. Sediment quality and primary and secondary producer communities were sampled in mid-summer.

Fish and fish habitat surveys: Fifty-seven lakes and 46 streams were sampled. Twelve lakes and 15 streams were identified as fish bearing. Fourteen additional streams may be fish bearing during high water.

Ecosystems: Terrain mapping and soil samples were collected, in conjunction with vegetation surveys in the project area. Field surveys were conducted to identify wetlands in the proposed project area. Vegetation tissue samples were collected for metal analysis at 10 sites.

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File Number: 12 404 746
Region(s): IN
Licence Number: 14742
Location: Muskox River, Aulavik National Park , Log River, Banks Island , Polar Bear Cabin, Aulavik National Park

Exploration for fossil vertebrates and wood on Banks Island, Northwest Territories

In 2010, our five-person research team spent just over a week (July 23 – July 31) searching for fossil wood, as well as vertebrate bones and teeth, in early Eocene (ca. 50-55 million years ago) sediments of the Eureka Sound Group cropping out on northern Banks Island, Northwest Territories. The research team focused there efforts on sediments near Muskox River, within the boundaries of Aulavik National Park. Additionally, an afternoon was spent surveying the rocks of the Eureka Sound Group near Log River on northern Banks Island by helicopter. Re-visiting localities that our team discovered at Muskox River in 2004, samples of extraordinarily preserved, mummified wood was collected and is being analyzed in the laboratory, in order to infer aspects of paleoclimate, including paleo-temperature and –precipitation. Several dozen teeth, belonging to sand tiger sharks, were also discovered. The living descendants of sand tiger sharks inhabit warm-temperate to tropical coastal marine waters. Additionally, several kinds of burrow, including ghost shrimp or Ophiomorpha, rare bone fragments, and fossil clams were discovered at Muskox River. The fossil wood and sharks' teeth indicate that Banks Island experienced a much warmer climate 50-55 million years ago than it does today.

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Region(s): IN **Location:** Banks Island

Environmental change in the Western Canadian Arctic Islands

During 2010, researchers and equipment were placed into field camps via Twin Otter aircraft and helicopter from Resolute Bay, Nunavut. One research team operated out of one small field camp on the northwest coast of Banks Island (June 28 - August 4, 2010). The second research team operated out of three small field camps on southern Banks Island (June 20 - August 12, 2010). A third research team entered the field from Sachs Harbour, by helicopter, and surveyed the small islands off the northwest coast of Banks Island (Phillips, Robilliard, Norway, and Bernard islands; June 28 - August 4, 2010). Transects from the camps were surveyed by helicopter (~10 days: from July 14-24), ATVs, and foot. Ancient shorelines, which are now far inland and above modern sea level, were mapped and surveyed. Fossils, which are frequently observed on these shorelines and the related raised marine sediments, were collected and radiocarbon dated. Radiocarbon dates, in combination with the mapped and surveyed raised shorelines, will be used to calculate rates of sea level change in the past. Collected fossils included marine mollusk shells (most commonly Hiatella arctica) and driftwood. A small number of fossil molluscs were collected from each site and only a few grams of driftwood were sampled, collectively representing only a very small proportion of the existing fossil material that is widespread on the landscape. Sample locations were surveyed and recorded using GPS receivers. Sample elevations were determined using digital altimeters. Large boulders were sampled for terrestrial cosmogenic nuclide dating by taking less than 1kg of rock from the upper surface of large boulders using a rock saw and chisel. Efforts were made to ensure that the sampled surface is left in a natural state. These studies will continue in 2011.

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File Number: 12 404 555 **Licence Number:** 14719
Region(s): NS **Location:** Daring Lake

Assessing snowpack water equivalent in the Yamba-Daring catchment, Coppermine River Basin, NWT for passive microwave development

The overall objective of this project is to asses the feasibility of utilizing passive microwave radiation, detected by radiometers on the SSM/I satellite (Special Sensor Microwave/Imager of the US Navy), to quantify snowpack water equivalent (SWE) on the ground during the winter season.

From 2004 until 2010, our field season focused on ground truthing the SWE in the tundra environment close to Daring Lake. In 2004 the research team established a sampling grid within the spatially defined resolution (25km x 25km) of the SSM/I satellite pixel, more or less centred over Daring Lake. A series of equidistant grid lines were established, oriented north-south and east-west, and SWE samples were taken along each grid line, in as many terrain units as possible. Each terrain must have a definable physical characteristic that makes it unique in terms of snow accumulation, but it must also be common within the study site. For example, lakes are one terrain unit, and east facing slopes (<7°) are another.

There are 11 terrain units defined within the study site. During the course of sampling, each terrain unit was well represented, so it is possible to quantify the variability and differences of SWE among the units. By quantifying SWE in each unit the research team can quantify the SWE value within the 25 x 25km satellite pixel and equate this to the single passive microwave signature the satellite provides for that location for that period of time. Over the course of several years (2004-2010) the research team has been able to document the relationship between SWE and the passive microwave signature. The relationship provides us with reasonable confidence that satellite data can be utilized to determine the SWE not only in this part of the low arctic, but in other parts of the low arctic tundra as well.

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File Number: 12 404 714
Region(s): IN, GW
Licence Number: 14635
Location: Mackenzie Delta and at stream sites on adjacent tundra uplands near Inuvik

Influence of Mackenzie Delta channel thermal regime on permafrost

Thirteen channels and 17 lakes distributed throughout the Mackenzie Delta were instrumented with temperature recorders, in order to determine mean annual basal (bottom) water temperature (MAWT) for the period of June 2009 to June 2010. Average MAWTs for perched lakes, channels, and connected lakes were 5.5°C, 4.6°C, and 3.4°C respectively. Perched lakes are lakes which are not connected to the channel network by a stream. Spatial variability of MAWT in the delta was less than 4.0°C. Perched lake MAWT was greater in the forest than in the tundra, while connected lake and channel MAWTs were consistent across the treeline. Perched lake basal temperatures were observed to increase following the formation of ice cover in the fall, while connected lake basal temperatures did not. The width distribution of Mackenzie Delta lakes and channels was determined using a geographic information system. MAWT and mean annual ground temperature for the delta were used, along with water body widths, to make predictions of the number of taliks that penetrate permafrost in the delta. A talik is a 'bulb' of unfrozen ground beneath an arctic water body. It is estimated that 60% of delta lakes and nearly the entire channel network maintain taliks through the permafrost.

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File Number: 12 404 652
Region(s): IN
Licence Number: 14678
Location: Beaufort Sea/Mackenzie Shelf/Amundsen Gulf region, from the icebreaker CCGS Amundsen

ArcticNet: an integrated regional impact study of the coastal western Canadian Arctic

Since 2004, ArcticNet has been using the Canadian research icebreaker CCGS Amundsen to carry out sampling operations in the Beaufort Sea/Mackenzie Shelf/Amundsen Gulf region, as part of its ongoing marine-based research program. The central aim of this research program is to study, on a long-term basis, how climate induced changes are impacting the marine ecosystem, contaminant transport, biogeochemical fluxes, and exchange processes across the ocean-sea-ice-atmosphere interface in the Canadian Arctic Ocean.

In 2010, sampling operations in the Beaufort Sea/Mackenzie Shelf/Amundsen Gulf region were carried out from the CCGS Amundsen from 12 August to 10 October. During these 59 days, researchers sampled at over 100 oceanographic stations. Sampling operations included deployments of a CTD-Rosette, box corer, piston corer, Agassiz trawl, Remotely Operated Vehicle and plankton nets. A total of 19 sub-surface oceanographic moorings and 12 moored hydrophones were deployed. In addition, a multitude of oceanic and atmospheric parameters were measured continuously using the Amundsen's impressive array of continuous samplers (SM-ADCP, EK-60 scientific echosounder, water surface pCO_2 and CTD on track system, foredeck and top bridge met towers, ceilometers, radiometer and all-sky camera). The ship's EM302 multibeam sonar and Knudsen sub-bottom profiler collected over 3,500 km of high-resolution bathymetry and sub-bottom data. On the bridge, Inuvialuit Marine Wildlife Observers spotted and identified marine mammals and seabirds. Data collected from this multi-year program will contribute to a better understanding of the impacts of climate variability and change on the physical, biological and geochemical processes in the Beaufort Sea/Mackenzie Shelf/Amundsen Gulf region.

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File Number: 12 404 744
Region(s): GW

Licence Number: 14739
Location: Upper Rat River near McDougall Pass in the Richardson Mountains:

Timing of glaciation and uplift of the Richardson Mountains and connection to Old Crow basin, northern Yukon

Samples of organic material were collected from sites that date to the late Pleistocene when the Laurentide Ice Sheet was retreating eastward toward the Mackenzie Valley. The research team also collected sediment samples for detrital zircon dating, to determine where the drainage of the region originated. A summary of this research was presented at the Geological Association of Canada Meeting in Ottawa last May.

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File Number: 12 404 755
Region(s): IN

Licence Number: 14768
Location: Illisarvik drained lake basin, Richards Island

Duration of active-layer freeze back, Illisarvik, NWT
All instruments were removed from the sites. The research project is still ongoing and will be completed in advance of the final project deadline.

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File Number: 12 404 687
Region(s): NS

Licence Number: 14638
Location: Daring Lake Terrestrial Ecosystem Research Station

Controls on carbon and nutrient cycling in arctic tundra
In 2010, the research team addressed the following research questions: What are the principal controls on the functioning of common tundra ecosystem types? And, How are they likely to be affected directly and indirectly by climate change? Two people measured new growth in birch stems from all of our experimental plots. Growth was most enhanced in the nitrogen plus phosphorus addition plots, indicating that the most severe limitation on shrub growth is nutrient availability, and that other factors like caribou browsing and deeper snow have little impact. Warmer temperatures (greenhouses) did increase growth suggesting that climate change would have a significant effect. These results will shortly be written up for publication.

What is the outcome of tundra plant-soil microbial competition for nitrogen over the 5-10 year time scale? Two researchers have been working together to analyse and publish data which demonstrated that deepened snow did not enhance plant nutrient uptake, but that the combination of deepened snow and more litter around taller shrub plants enhanced nutrient uptake.

What are the impacts of herbivory on vegetation production and composition? And, How might these impacts be altered as a result of climate change? Caribou herbivory effects on tissue chemistry were presented at a high-level conference in the U.K., in April 2010. Extensive observations of caribou browsing impacts were made, and studies on the controls on tissue phenolic chemistry were conducted, including responses to simulated herbivory and genetic variation among individual plants. These data on the impacts of caribou on plant phenolic concentrations have not yet been chemically analysed, and so results are not yet available.

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File Number: 12 404 665
Region(s): IN

Licence Number: 14628
Location: Offshore program in and near Ajurak Exploration Licence

Ajurak 2009 field data collection program continuation

Between December 2, 2009 and January 16, 2010, eight CALIB ice drift buoys were deployed on the ice cover of the Beaufort Sea, in and near Exploration Licence 446 (Ajurak). Buoy 99144 (Location 5) failed upon deployment. Buoy 30445 (Location 4) transmitted its location from December 2, 2009 until January 20, 2010, when the buoy was likely damaged by ice movement. All remaining buoys were successfully transmitting, with reports being generated as of January 21, 2010.

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File Number: 12 404 493
Region(s): SS
Licence Number: 14672
Location: Along the Hay River from approximately Enterprise to the Town of Hay River.

Hay River ice jam study

The 2010 field research program brought members of the University of Alberta (UofA) team and colleagues from the Department of Indian Affairs and Northern Development (DIAND) to the Town of Hay River from April 15 to 29, in order to observe, measure and document river breakup ice conditions. During breakup, U of A/DIAND field crews worked with the Town Flood Watch Committee to measure ice jams and to document the river's breakup progression. Again this year, a significant amount of water and ice moved into both delta channels and some minor flooding occurred. The U of A/DIAND team assisted the Town of Hay River with their enhanced breakup web site, keeping residents apprised of breakup conditions as they developed. Web cameras, water and ice levels and ice maps were posted for the public.

Operational testing of the U of A ice jam flood forecasting models was conducted during breakup 2010. The timing of the onset of breakup, the expected peak snowmelt runoff streamflow, the time of arrival of the critical ice push and the expected extent of flooding were all predicted with reasonable accuracy. The U of A will be training DIAND staff to use these forecasting tools in future breakups and U of A/DIAND will be visiting the community in early 2011, in order to present the results of this study.

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File Number: 12 404 717
Region(s): GW, DC, SS
Licence Number: 14802
Location: Mackenzie River and Arctic Red River at Tsiigehtchic; Peel River at Fort McPherson; Liard River at Fort Simpson; Slave River at Fort Smith

Geological carbon in the Mackenzie River Basin: Sources and sinks of atmospheric carbon dioxide

During September 2010 the research team collected samples from throughout the Mackenzie River Basin as planned. The logistical advice and equipment support from the Aurora Research Institute, Environment Canada, and the local communities with whom the research team discussed the project before fieldwork were essential. As in June 2009, river water and suspended sediment samples were collected from depth profiles within river channels, using our custom-built, clean, depth sampler, while using an Acoustic Doppler Current Profiler to measure the velocity of the water. This allows us to calculate the amount of water and sediment transported.

Some notable differences were seen between June 2009 and September 2010. First, in the Mackenzie River a much lower suspended sediment concentration was observed in September 2010. This was expected, since the water discharge is much lower at this time of the year and the supply of sediment decreases after the freshet. However, it was surprising at how constant the concentration was with depth in the river. It is expected that rivers sort their sediment load to a greater degree. Sediments are currently being analyzed for their organic and inorganic chemistry to constrain the source of carbon in the water and sediments.

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File Number: 12 404 713
Region(s): GW
Licence Number: 14629
Location: Mackenzie River near Inuvik and near the ferry crossing at Tsiigehtchic

Arctic Great Rivers Observatory

This project studies the 6 largest rivers that flow into the Arctic Ocean: in North America the Mackenzie and Yukon, and in Russia the Ob', Yenisey, Lena, and Kolyma. The research team are measuring the concentration of naturally occurring chemicals, such as carbon, nitrogen, and phosphorus, in these rivers, in order to obtain baseline information about the flow of these chemicals to the ocean, and to help us understand how climate change is impacting Arctic rivers.

This is a 3 year project, and the research team are now nearing the end of the second year. Most of our samples have been collected, but laboratory analyses are still underway. All data from this project is posted on a public website (http://www.aoncadis.org/) and is available for free download by the public. 2 sampling trips were taken to the Mackenzie River in 2010. During the first sampling trip (late May and June), daily 1 litre samples of riverwater were taken from the shore near Inuvik, and also took 3 samples by boat near the Tsiigehtchic ferry crossing. For the second (during September), one sample was taken by boat near Tsiigehtchic. All samples taken by boat were less than 15 litres of water. Our final sampling trip occurred in early March, 2011. During our 2010 sampling year, it was fortunate to have members of the Gwich'in RRenewable Resources Board provide local field support.

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File Number: 12 404 661
Region(s): SS

Licence Number: 14644
Location: Along the Old Canadian National railbed extending from the West Limit to the East Limit, and along the Highway 5 corridor

Old Canadian National railbed and Highway 5 soil sampling, Hay River area

In 2010, soil sampling was conducted at 13 sites that were located 5 m north and 5 m south of the railbed at the surface (0-15 cm) and sub-surface (15-30 cm). Lead and zinc levels were above Canadian Council of Ministers of the Environment (CCME) industrial guideline values for both metals at many sites on the railbed, particularly near the Pine Point mine site. Elevated levels of zinc were also measured at many sites beside the railbed; however, few off-railbed sites had high concentrations of lead. Higher levels of lead and zinc were observed in the surface soil layer. Soil samples were taken at increasing distances (up to 50 m) from three known contaminated areas on the railbed, to determine the extent of lead and zinc contamination. At all of the sites, lead levels were below the guideline value, except on the railbed. Concentrations of zinc above the guideline value were detected between 15 and 50 m away from the railbed. Water samples were taken from 9 ponds next to the railbed and Polar Lake, to determine concentrations of lead and zinc. CCME water quality guidelines for lead and zinc were exceeded in a pond close to the Pine Point mine site and two ponds located west of Birch Creek.

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File Number: 12 404 116
Region(s): SA

Licence Number: 14642
Location: Canol Heritage Trail, extending from MacMillan Pass (Yukon border) to Caribou Pass.

Long-term ecological and geomorphological investigations in the alpine tundra of the Mackenzie Mountains, NWT

In August 2010, the 7 monitoring sites were visited and data was collected on depth of thaw. In addition, a new thaw depth survey site was established, climate stations were serviced and data retrieved. The two Dale Creek automated climate stations had some damage by animals and the Goose Flats site needed significant repairs. Permafrost warming is on the order of 0.75 to 1.25°C, despite atmospheric cooling in the past 2-3 years. Permafrost landforms continue to shrink in area at a rate of ~1% each year. Lack of change in thaw depth on the top of permafrost features confirms they are shrinking from their edges. Studies of tree colonization in the tundra confirms that most originated after 1800 Common Era (CE), but some around 1700 CE. Growth over the past few decades is greater than in the past.

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File Number: 12 404 545 **Licence Number:** 14685
Region(s): IN, GW **Location:** Mackenzie Delta

Environmental studies across treeline

In 2010 the research team continued long-term monitoring of permafrost conditions, including ground temperatures and conditions, at proposed Mackenzie Gas Pipeline stream crossings. Ongoing collection of these parameters will allow for an assessment of changes in response to regional climate warming.

Comparisons of ground temperatures from the 1970s with those collected since 2000 shows an increase of 1 to 2 degrees C in the uplands east of the delta, but no corresponding warming in the delta itself. The dampened response in the delta is likely due to the moderating effect of the many lakes and channels. A program to collect water samples from tundra lakes with and without thaw slumps was continued. An initial analysis showed that lakes with slumps on the shore tended to have clearer water than undisturbed lakes because sediment from the slumps removed organic tannins from the water.

Tall shrubs were removed from a drilling-mud sump near Taglu Island in the outer Mackenzie Delta to study the impacts of shrub removal on ground temperatures. The research team believes that temperatures within the sump will decrease due to the lack of shrubs and snow. Shrub removal may be a useful long-term sump management technique to retain permafrost in the cap.

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File Number: 12 404 545 **Licence Number:** 14753
Region(s): GW **Location:** The Stoney Creek catchment, Peel Plateau

Evaluating the environmental impacts of permafrost mega-disturbances along the Dempster Highway

Amongst the most dramatic landscape responses to changing climate conditions is the increase in thaw slump activity. In 2010 the research team documented some of the largest retrogressive thaw slumps documented in the NWT (< 10 ha) developing along the stream valleys that drain the Peel Plateau. The project involved a collaboration between government, academic researchers and the community members of Fort McPherson. Time lapse photography showed clear daily patterns in mudflow activity driven by solar radiation and headwall thawing. However, several intense rainfall events in the summer of 2010 caused significant mudflows that extended more than 1 km down the stream valley. The impacts of mega-slumps on stream water quality are also profound. Water samples and continuous sensors deployed in impacted and unimpacted streams illustrate dramatic contrasts in turbidity and conductivity. In streams impacted by thaw slumps, turbidity, and to a lesser extent conductivity, exhibit diurnal variations driven by solar radiation, headwall ablation and slump melt water runoff contributions. These unique patterns of variation were also evident at the basin scale indicating the significant influence that large active slumps can have on the geochemical and sediment regimes of northern streams. The researchers plan to participate in a community water workshop planned for early 2011. The research team also worked with Tsiigehtchic to establish community-based permafrost monitoring sites.

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File Number: 12 404 739
Region(s): NS
Licence Number: 14718
Location: Fortune Mineral's NICO property

Environmental baseline surveys of Fortune Minerals Ltd's NICO project
Environmental surveys were completed in the NICO Project site, and along the proposed routes of an all weather access road to Behchokò. Fish and fish habitat, water, sediment and vegetation were described. A fish and fish habitat survey was completed within the area potentially impacted by the project footprint, and along the proposed access road route and proposed transmission line. Fish habitat was surveyed visually, and depth was measured using a depth sounder and measuring line. Water and sediment quality surveys were completed at water bodies within and downstream of the project.

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Licence Number: 14679
Location: Daring Lake

Exchange of carbon gas fluxes over low arctic tundra
This is a continuing research project with the overarching objective of furthering our understanding of the rate and variation in exchange of carbon-based gases (carbon dioxide and methane) between low arctic tundra and the atmosphere. The research is important because the build up of these gases in the atmosphere causes climate change. Arctic tundra has the capacity to remove excess carbon dioxide through plant growth, yet carbon-based gases may be released with permafrost thawing. Future climate change will depend partly on the balance of these processes. In 2010, the research team expanded their research sites by adding a shrub tundra site to the 3 established sites: sedge fen, mixed and hummock tundras. The new site was instrumented with the same equipment as the existing sites, namely sensors to monitor atmospheric carbon dioxide concentrations, meteorology, soil moisture and temperature. Although no preliminary results are available yet, data from these four sites will allow us to examine how different tundra types take in and release carbon dioxide and how weather affects those exchanges. These experiments began in 2004 and the continued monitoring allows us to develop an increasingly detailed understanding of the functioning of the tundra landscape. The results then are used to construct and test regional and global models of present and future climate.

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Region(s): IN, GW
Licence Number: 14758
Location: Northern Richardson Mountains

Dall sheep, grizzly bear and wolf interactions in the Richardson Project: collar retrieval and fence removal

On August 30th, three Gwich'in Renewable Resource Board (GRRB) staff members retrieved the collars and visited the fence exclosure locations to ensure no research material remained in the mountains. They retrieved three collars but were unable to locate three others (that were no longer broadcasting a signal), despite extensive searches at each location. In checking the fence locations, they retrieved one metal post that had been missed before. No other materials were found. The crew flew the surrounding area within one kilometre or so of the coordinates. Nothing was found that needed to be removed. This completed the fieldwork related to the Dall sheep, grizzly bear and wolf project in the Richardson Mountains. Results are still being analyzed, but one article related to the overlap between the three species was published in 2010. Analysis continues at the University of Alberta, and other publications with colleagues are being prepared.

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File Number: 12 404 567
Region(s): IN
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Location: Shellabear Point and Chevalier Bay

Evolution of coastal lakes in the high arctic

The goal is to distinguish the chemical and physical processes acting on different coastal lakes, in order to understand how these systems have developed through time. Water from lakes at both field sites was sampled for laboratory analysis. This was the fourth year of sampling at Shellabear Lake, and it was being tested to see if the lake at Chevalier Bay is also hypersaline. A short sediment core was taken from the latter site, in order to evaluate the potential to reconstruct past climate from the sediments. Researchers were flown via helicopter from a nearby camp at Cape Bounty, Melville Island, Nunavut to sample at the lakes. Site visits at each lake lasted 3-4 hours. If results from Chevalier Bay show promise, more sampling or a camp for up to one month may be established in 2011.

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Location: Kennedy Lake Watershed

2010 Environmental monitoring program

In preparation for upcoming permit applications, and to assist with project design and effects mitigation, baseline environmental studies were conducted during the spring, summer and fall in the area surrounding the Gahcho Kue Project. The surveys were conducted with the assistance of representatives from Yellowknife's Dene First Nation and Łútsęlk'é's Dene First Nation. The studies encompassed weather, air quality, fisheries, water quality, and hydrology.

The hydrological regime was monitored through measurement of water levels and river flow between each water body. Factors affecting hydrology, such as precipitation, temperature and humidity, were also monitored. Meterological data was recorded throughout the year from the weather station on site. Noise meters were deployed at two stations to record baseline noise levels in the study area. Fish surveys were conducted in small lakes and streams throughout the local study area in July, and Kennady Lake in August. The surveys included gill netting, electrofishing and minnow trapping. Fish habitat was also mapped in the surrounding streams and small lakes. In August, gill netting and hydroacoustical surveys were conducted concurrently in Kennady Lake to obtain an updated large-bodied fish population estimate. Water samples were collected in July to update water quality information in Kennady Lake, and surrounding and downstream lakes. Stream outlets and lakes were surveyed along with the watershed adjacent to Kennady Lake. Benthic invertebrate sampling was also conducted in the lakes.

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File Number: 12 404 758
Region(s): IN
Licence Number: 14781
Location: Mackenzie Delta uplands and sites near the communities of Inuvik, Aklavik and Tuktoyaktuk

Vegetation monitoring and science training in the Mackenzie Delta region

Fine scale mapping using historical air photos shows that the vegetation in upland tundra north of Inuvik has changed significantly in recent decades, with the abundance of upright shrubs increasing by 15%, since 1972. To track vegetation change across shorter time scales, INAC and researchers at the University of Victoria have been developing a community based vegetation monitoring protocol. The research team have been testing this protocol in the Mackenzie Delta region since 2009. In August 2010, work was done with community members to establish vegetation and permafrost monitoring sites in shrub tundra regions near Tuktoyaktuk, Inuvik and Aklavik. Data collected in 2009 and 2010 is being used in a power analysis, to evaluate the ability of our sampling design to detect changes in the abundance of plant functional groups. Data collected using this protocol will also contribute to investigations to understand broad-scale drivers of vegetation change.

In the fall of 1999, a severe storm surge inundated large areas of the outer Mackenzie Delta with salt water, killing more than 10,000 ha of vegetation. Repeated visits to the impacted area indicate that recovery is patchy, proceeding slowly in some areas, and not at all in other areas. The nature and rate of re-vegetation in this area has important implications for traditional harvesting, protected areas planning, and the management of development impacts. During the 2010 field season, the research team re-sampled 132 permanent plots, established in 2007 to track changes in vegetation and soil chemistry in this area. This plot-scale research will be combined with investigations using high resolution satellite imagery to track vegetation change. To support this broad-scale work, a systematic aerial survey was conducted of the dead zone and captured approximately 1000 oblique photos (infrared and color).

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File Number: 12 404 708
Region(s): NS, SS
Licence Number: 14728
Location: Barnston, Beaulieu, Hoarfrost, and Waldron Rivers

NT Hydro hydrology monitoring program

In May 2010, NT Hydro's contractor, Water Survey of Canada, installed water gauging stations on the Hoarfrost, Barnston, Beaulieu and Waldron Rivers. Gauging stations are remotely operated and collect hydrology data on a full time continuous basis. The goal of the program is to collect hydrology information to better understand the hydrology and hydro potential of these rivers. Hydrology information collected includes: water level, water and air temperature, water volume and velocity. Data will be collected over the next 2-3 years to develop a hydrology record for these rivers. Once enough data has been compiled, NT Hydro will be able to evaluate the hydro potential of these rivers.

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File Number: 12 404 485
Region(s): IN, GW
Licence Number: 14687
Location: Mackenzie Delta

Biogeochemistry of lakes in the Mackenzie Delta

Water samples were taken from Mackenzie Delta lakes and channels in 2010 in order to measure nutrient and carbon concentrations during the spring break-up, flooded and open-water periods. Water samples were taken back to the Inuvik Research Centre, where they were filtered and processed. Ammonium, phosphorus, and chlorophyll concentrations were measured at the research centre, while some other samples were sent to a government lab for analysis of particulate nutrients and total dissolved nitrogen. The rest of the samples were shipped to Simon Fraser University, where carbon and major ion concentrations were measured.

While in Inuvik, the research team also did a three-week-long experiment to see whether carbon in Mackenzie River floodwater is more likely to be used by bacteria as a food source after prolonged exposure to sunlight, which breaks down large carbon molecules into smaller ones. Although our results are preliminary, they indicate that, during the break-up and flood, measured levels of sediment and carbon in Delta channels are far higher than those measured during the open-water season. Also, exposure of floodwater to sunlight, which is similar to when floodwater sits on the Mackenzie Delta floodplain during the annual spring flood, increases the use of floodwater carbon by bacteria. Therefore, floodwater carbon could be an important food source for the marine food web in the Beaufort Sea during the early summer.

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File Number: 12 404 749
Region(s): SA
Licence Number: 14750
Location: Tertiary Hills , Little Bear River, Police Island

Paleontology of the Cretaceous-Tertiary boundary in the arctic of the Northwest Territories, Canada To better understand how the K-T extinction affected polar regions, and whether the extinction was more severe in the high arctic, this project was designed to search for dinosaur and mammal fossils in the Brackett Basin. Previous work by the Geological Survey of Canada found Cretaceous and Palaeocene rocks of the Summit Creek Formation along the Mackenzie and to the south in the Tertiary Hills. The area has never been explored for vertebrate fossils, but dinosaur bone has been found in the area. The primary goal of this project was to collect small fossils, such as teeth, small bones, and scales from three locations in the Brackett Basin: the Tertiary Hills, the bank of the Mackenzie River near Police Island, and the confluence of the Brackett and Great Bear rivers.

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File Number: 12 404 529
Region(s): SA
Licence Number: 14652
Location: Mackenzie River Plain, Franklin Mountains and parts of the Mackenzie Mountains

Geological fieldwork in Mackenzie Plain and adjacent mountains
A team of 10 scientists from the Geological Survey of Canada (Calgary), the Northwest Territories Geoscience Office (Yellowknife), University of Calgary, and Laurentian University did geological field work based out of Norman Wells for 6 weeks in July and August of 2010. They were also accompanied by two Wildlife Monitors from Tulıt'a. Helicopter services, accommodation, and food services were provided by local businesses in Norman Wells.

Field work involved landing by helicopter or overland hiking to 460 rock outcrop sites on ridges and stream exposures from the eastern Mackenzie Mountains to the Franklin Mountains. Locations and rock descriptions were recorded, and measurements of thickness and orientation were taken. Approximately 750 rock samples were collected, varying from fist size to slightly larger than a loaf of bread. These samples have been shipped to labs at the Geological Survey of Canada in Calgary and Laurentian University, where they are currently undergoing paleontological, geochronological and organic chemistry analyses. These data are being used to produce updated maps of the bedrock geology for the areas around Norman Wells and Tulıt'a (NTS map areas 96C, 96D, 96E, and 96F).

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File Number: 12 404 378
Region(s): IN
Licence Number: 14637
Location: Trail Valley Creek, Havikpak Creek, Denis Lagoon, Big Lake

Hydrological studies, Mackenzie Delta region

The following results have been obtained over the last year.
(1) Progress has continued on improving hydrologic models for predicting future changes in snowcover, streamflow, and lake levels. These improved models allow us to consider the role of a changing climate and resource development on the hydrology of this region. Published reports have used these models to show that there has been little change in upland lake levels over the last 32 years. Another report showed that climate change over the coming decades is likely to result in large changes in streamflow, with spring runoff occurring earlier, increased runoff over the summer, and an increase in the occurrence of mid-winter melts.
(2) Studies have begun to consider the impact of changing climate on permafrost, and the effect of this on the hydrology of the region. Published papers have outlined the overall impacts of changes in ice rich permafrost on water resources.
(3) Research observations in the Mackenzie Delta have demonstrated the frequency of flooding in the outer delta and shown the importance of ice conditions at the outlet of the delta to the Beaufort Sea in controlling water levels. These observations are improving our ability to predict water levels in the delta. Another study showed that for the low elevation delta lakes, the number of days the lakes are connected to the main channels has increased, but that for the higher elevation delta lakes the number of days they are connected to the main channels has decreased. Ongoing research is considering the reasons for these changes.

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File Number: 12 404 728
Region(s): NS, SS
Licence Number: 14670
Location: Snap Lake and the regional study area

De Beers Snap Lake Mine - 2010 environmental monitoring program

Aquatics: Increases were found, relative to baseline levels, in dissolved salts, nutrients and a few metals in the water in Snap Lake in 2010. These changes are not harmful to fish or other life in Snap Lake. The amount and types of algae and bugs that live both in the water and on the bottom of Snap Lake were checked, to see if there were any changes in food for fish compared to previous years. The amount and types of algae and bugs in the water of Snap Lake have changed from year to year but similar changes also occurred in all lakes, including the reference lake.

Hydrology: The results indicate that 2010 had low water levels and streamflows compared to previous years. Snap Lake water levels continue to exhibit similar increases and decreases as other monitored lakes in the surrounding area.

Vegetation: Based on aerial photography, all vegetation communities were impacted less than expected, except for the esker. Dustfall at two stations exceeded air quality guidelines for 4 months. Overall, dust does not appear to be having an effect on vegetation at the mine site.

Wildlife: In 2010, monitoring indicators for caribou, grizzly bear and wolverine all indicated low levels of activity. Monitoring of peregrine falcon nests was continued in the area. The number of occupied nests was higher than 2009, but the total number of chicks observed was within the range observed during the baseline studies.

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File Number: 12 404 248
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Region(s): IN
Location: Beaufort Sea

Decadal variability of marine hazards
Field research was conducted from CCGS Sir Wilfrid Laurier in September-October 2010, with participants from Fisheries and Oceans, the Geological Survey of Canada and the Monterey Bay Aquarium Research Institute. Sub-sea moorings deployed in 2009 were recovered from 5 sites on the Beaufort shelf. The moorings supported instruments measuring ice thickness, storm waves, sea level, currents, temperature, salinity and plankton. The instruments recorded data every few minutes for 12 months. Replacement moorings were deployed for continued operation through September 2011. Surveys were conducted near known vents, releasing methane from the seabed. The surveys crossed from the shallow outer shelf, where methane ice has formed in cold sub-sea permafrost, to deeper water on the continental slope, where methane ice has formed under high pressure. Echo sounders were operated to detect and map the rising plumes of gas bubbles and to determine how much gas is released from the vents. A tethered submersible was used to conduct visual and camera reconnaissance of gas vents, the plumes rising from them and associated biologic communities. Mud samples were collected at vents for later analysis for trapped gas and sediment chemistry.

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File Number: 12 404 727
Region(s): IN

Licence Number: 14667
Location: Western part of Victoria Island centred on Minto Inlet and includes the community of Ulukhaktok

Minto Inlier, NWT aeromagnetic survey 2010

The objective of this research was to acquire high-resolution aeromagnetic data in an area centred on Minto Inlet, including the community of Ulukhaktok. Aeromagnetic surveys measure magnetic properties of bedrock and are one of the tools used in geological mapping. Understanding this magnetic data will help geologists map the area, assist mineral exploration activities, and provide useful information necessary for communities, aboriginal associations, and governments to make land use decisions.

The survey collected approximately 79,000 line km of data flown along parallel lines spaced 400 m apart. The flying height was at a nominal terrain clearance of 150 m. The intensity of the total magnetic field was measured from the aircraft. The survey was to be flown between July 15, 2009 and October 15, 2009, however, poor flying conditions halted the survey and it was continued in Spring 2010. Acquisition was completed on May 28, 2010. Final data have been accepted for the survey and the data and maps were published on November 16, 2010. Copies of all maps were sent to the Hamlet Council in Uluhaktok. The data are available for free download from the Geoscience Data Repository for Aeromagnetic and Electromagnetic Data (http://gdr.nrcan.gc.ca/aeromag), and digital versions of the maps are similarly available from MIRAGE (http://gdr.nrcan.gc.ca/mirage). The survey results were presented at a poster session of the Yellowknife Geoscience Forum on November 16, 2010.The data acquired over the Minto Inlier area are of high quality and will serve their intended purpose.

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File Number: 12 404 734
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Licence Number: 14707
Location: Mackenzie Mountains

Geology of the Redstone Copperbelt

A successful field season was had in the summer of 2010, where data was collected regarding the genesis of copper deposits in the Redstone Copperbelt. Geological mapping was completed and many rock samples were taken for further research. Studies continue at the University of British Columbia on samples collected to date. This work will help focus the next field season, commencing in the summer of 2011.The findings of the 2010 field season are at an early stage of interpretation, however initial data show promising results for gaining a wider insight into how these geological systems operate and what scientific processes are responsible for generating these anomalous concentrations of metals in the Earth.

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Licence Number: 14688
Location: East to West across East Arm of Great Slave Lake: Blanchet Island, Ethan Island, Pethei Peninsula, Snowdrift, Wildbread Bay, and Sentinel Point

Paleomagnetism of East Arm of Great Slave Lake

The objectives of this project were to:

1) Re-sample previously sampled strata that have yielded evidence for geographic shifts.
2) Sample previously unsampled strata in between previously sampled units, in order to capture a more continuous record of Slave province's geographic whereabouts.
3) Sample several parallel (or repeat) stratigraphic sections, in order to demonstrate that results can be produced. For example, the research team will sample the same repeated section at both Ethan and Blanchet Islands in order to demonstrate reproducibility).

For paleomagnetic sampling small finger-sized cores from exposed strata were collected. Cores, rather than random blocks, are needed, since the current orientation of the rock is needed, in order to back-calculate the "fossilized" magnetization direction. Cores are drilled with a hand-held modified chain saw. Small paleomagnetic cores are generally much smaller than typical geological samples so the impact to the environment is particularly small. Back in the laboratory at Yale University, the research team measured the magnetism of the cores. Isolating the ancient fossilized magnetization often involves heating the cores to elevated temperatures so that only the most stable magnetic minerals stick around.

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File Number: 12 404 759
Region(s): GW, NS

Licence Number: 14789
Location: Point Lake, Russell Lake, Damoti Lake, Bell Lake

Investigating the influence of Archean seawater composition on the evolution and diversity of microbial metallo-enzyme evolution through the chemistry of Archean banded iron formation

The oxidation of our atmosphere approximately 2.4 billion (Ga) years ago is perhaps among the most important events in the evolution of life on Earth, but the exact cause(s) of this event are still being debated. A more in-depth understanding of ocean composition leading up to the Great Oxidation Event (GOE) could reveal some answers in this regard. Chemical sediments, such as banded iron formation (BIF), are perhaps the best lithology to study, because they precipitated directly out of seawater. The newly discovered, well-preserved 2.8-2.6 Ga year old BIF units in the Central Slave Craton of the Northwest Territories (NWT) provide the unique opportunity to study the period right before this event. In August 2010, the research team explored these units for the first time and took transects of the sampling areas, as well as a number of samples for preliminary petrographic and chemical analyses. This work has provided the stratigraphic, initial petrographic, and geochemical framework needed to conduct the necessary geochemical analytical work in summer 2011. Sampling sites included the approximately 2.62 Gyr old BIF at Point Lake, which is interbedded with greywacke-mudstone turbidites, the approximately 2.85 Gyr old BIF in the Central Slave Cover Group ~30 km north of Yellowknife, and detailed sampling of a BIF belonging to the Central Slave Cover Group at the NTGO core lab. A representative portion of these samples have been made into thin sections for petrographic and chemical analyses, which are currently underway.

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File Number: 12 404 725
Region(s): IN
Licence Number: 14663
Location: Coastal Mackenzie Delta, Ellice Island, Langley Island

Analyzing oceanic storm surge impacts within the coastal Mackenzie Delta, NWT

The 2010 field campaign took place between July 27-30, 2010, along coastal regions of the Mackenzie Delta, NWT, Canada. The focus of this survey was to assess the rate of re-vegetation from the September 1999 oceanic storm surge. Field investigations consisted of helicopter and ground photography, to be used as validation for Landsat satellite imagery. Upon completion, key findings resulting from this campaign are as follows. Aerial surveys confirm the estimated 10,000 km^2 of dead vegetation seen from satellite imagery that remains over a decade after the oceanic storm surge event. However, vegetation regeneration is occurring, verified by the ground assessment, which is undetectable from Landsat or aerial imagery. It appears that only pioneer type plant species, such as grasses and sedges, are establishing and revegation is highly localised to areas directly adjacent to water bodies. Areas along river banks, in particular, have the greatest re-vegetation rates and vegetation species diversity, followed by areas occupying the perimeter of lakes and then by coastline regions. In the remaining killed vegetation zones of the outer delta, traces of salt can still be found on the ground and on the dead vegetation, corroborating the predictions that 1) there are no saltwater-type vegetation species found in the region, 2) the saline concentration in the soil appears to be a significant limitation for vegetation reestablishment and 3) areas not frequently flooded or in contact with freshwater sources remain unable to flush out the salt water intrusion from the 1999 storm event.

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File Number: 12 404 724
Region(s): IN
Licence Number: 14659
Location: Any ice islands from Borden Island to Prince Patrick Island

Ice island drift tracking

This project aims to track large 'extreme ice features,' such as ice islands and icebergs that have broken off of ice shelves along the northern coast of Ellesmere Island. These large floating masses of ice, as well as large floes of thick multiyear ice, are considered to be hazardous to navigation and oil exploration activities. Analyzing their drift patterns will help scientists determine where they go and how long they last before breaking up or melting. Four ice-drift tracking beacons were successfully deployed in April 2010, near Borden Island, by scientists who were working on a hydrographic project called UNCLOS. The beacons were placed on 'extreme ice features' using a helicopter. This year's field work is complete, but satellite imagery of these ice pieces will continue to be aquired, in order to determine how they are changing over time. The research team expects to gather location information from these beacons for the next 2 years. The location of 3 beacons is publically available online. It is expected that they will record a southerly or southwesterly drift.

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File Number: 12 404 736
Region(s): SS
Licence Number: 14712
Location: Thor Lake, approximately 100 km southeast of Yellowknife and 100 km south west of Łútsę̀lk'é

Petrogenesis of the Blachford Lake intrusive suite

Field work during the 2010 field season was performed by two geologists. By setting up small fly camps, accessed by float plane from Yellowknife, large areas of the Blachford Lake Intrusive Suite and related alkaline rocks could be investigated over the course of the summer. Field work was also done out of Blachford Lake Lodge, and Avalon Rare-Metals exploration camp, as these areas also provided access to a drill core, which was sampled with the permission of both Avalon and Kodiak Resources Ltd. Field work consisted of mapping and sampling various intrusive phases, and identifying areas with mineralization potential within them. During a week in August, the 29 km long Simpson Island Dyke was mapped and sampled from a fly camp on Simpson Island in the East Arm. Helicopter support was used for three days at the end of the program, during which the field crew examined key outcrops identified during the summer, as well as remote locations, which included the following: amphibolite island in Francois bay, dioritic sills on Caribou Island, and contacts between the Mad Lake Granite and Whiteman Lake Syenite.

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File Number: 12 404 726
Region(s): IN
Licence Number: 14664
Location: Inuvik, Tuktoyaktuk

Strategic environmental assessment roles and stakes in arctic oil and gas exploration and development

The first field season focused on views of the environmental assessment (EA) system in the Beaufort Sea, and the potential for a more regional and strategic approach. The research team focused on what's working and not working, as well as what a more regional and strategic approach to EA can and should deliver, and to whom. A graduate student spent three weeks in Inuvik meeting with individuals from various boards and agencies – in addition to industry and federal government. Some spoke positively of the current EA system, saying it is effective 'as is', but most identified challenges related to cumulative effects, data, inefficiencies, and the need for, but lack of, a more regional/planning-based approach. There was general agreement about the need for a more regional and strategic approach to EA, but some saw this as a data collection and monitoring exercise, whereas others saw the need to be more proactive – a planning based approach looking toward the future. Further analysis will address areas of agreement and disagreement, and the nature of this. Most all, however, it was said that the capacity to advance current EA practices from where it is to where it should be is lacking. This will, in part, be the focus of the next phase.

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File Number: 12 404 738
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Region(s): IN
Location: Illisarvik drained lake basin, Richards Island,

The development of aggradational ice at Illisarvik, Richards Island, NWT

Samples of near-surface permafrost were obtained from several locations on Richards Island, NWT in summer 2010, to investigate the growth of near-surface ground ice and the relations between controlling factors and ice formation. Twenty-six sites were sampled in the Illisarvik drained lake basin, three sites on lake basin terraces, and nine sites in the surrounding tundra. Active-layer records from the basin, tundra, and lake terrace were also examined. Active-layer thicknesses were found to be associated with summer air temperatures, and in some lake basin areas, with winter snow depths. Excess-ice accumulation is highly variable in the basin. It is predominantly controlled by active-layer moisture status, and to a lesser extent by soil texture. Excess-ice contents in the tundra were much greater than in the basin, and ice enrichment was present at greater depths, likely a result of permafrost aggradation, since the early-Holocene climatic optimum. This research was conducted for an M.Sc. thesis. The entire thesis will be made available once it has been completed.

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Region(s): NS
Location: On the roof of the Aurora College building in Yellowknife

Sunphotometer measurements at Yellowknife

The sunphotometer system at Aurora College is automated so that data was collected from April to late fall of 2010. There was, however, a significant data gap from April until August, due to a battery problem. Otherwise, 2010 was a rather uneventful (half) summer in terms of aerosol intrusions over Yellowknife, as compared with 2009 when there was significant smoke as well as the presence of stratospheric aerosols from the Sarychev volcano in Russia (north of Japan).

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Region(s): IN
Licence Number: 14724
Location: The shelf edge offshore of the Mackenzie Delta.

Assessment of the western arctic boundary current

Cruise HLY1003 of the US Coast Guard Cutter Healy took place from September 7 to 27, 2010. The title of the field program is "Assessing the Western Arctic Boundary Current and its role in the Arctic ecosystem and climate change", funded by the US National Science Foundation as part of the Arctic Observing Network (AON). The project is a collaboration between US and Canadian scientists. The research team is using a combination of year-round subsurface moorings in the boundary current, deployed upstream in US waters, and seasonal (summertime) shipboard observations, including measurements downstream in Canadian waters. During cruise HLY1003 the research team successfully deployed all of the moorings, and carried out a hydrographic survey of the boundary current from Barrow Canyon along the continental slope into Canadian waters to the vicinity of 130W. The survey consisted of 13 cross-slope transects using a conductivity/temperature/depth (CTD) package, equipped with a transmissometer, fluorometer, and oxygen sensor. Niskin bottles were used for water sample measurements of dissolved oxygen, nutrients, dissolved organic and inorganic carbon, total alkalinity, total organic carbon, and total organic nitrogen. Velocity measurements were made using the hull-mounted acoustic Doppler current profiler (ADCP).

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File Number: 12 404 724
Region(s): SA
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Location: Norman Wells

Wind energy monitoring in Norman Wells 2009-2010

The objective of this wind monitoring proposal is to quantify wind energy potential to assess the economic feasibility of building a wind farm in Norman Wells, a remote community that is dependent on gas-electric generation. The wind monitoring equipment was installed in September 2008, and this site continued to collect wind data until September 2010.

A community wind monitor visited the wind tower site monthly and maintained the monitoring site equipment. Data files were downloaded monthly. Reporting and data management were maintained by

Aurora Research Institute (ARI) staff in conjunction with the project engineer. Wind monitoring data was collected for the entire two year period. All data were stored at ARI and will be analyzed by the project engineer. A pre-feasibility report with preliminary wind data analysis after one year of data collection is currently available on the ARI website. A final report will be compiled with a complete wind analysis, including two full years of data, after the completion of the wind monitoring in September 2010. The final report will be posted on the ARI website. Copies of the report will also be distributed to the Norman Wells community organizations.

The wind monitoring equipment was removed from the site in September 2010. This was done by an ARI technician with the assistance of the Norman Wells community wind monitor.

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File Number: 12 404 640
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Region(s): IN, GW
Location: Central and western Mackenzie Delta, east of the Delta around Noell Lake, and Gwich'in Jak Park

Examining the impacts of climate change on aquatic and terrestrial ecosystems of the Mackenzie region

The objective of this research is to document the impacts of disturbance on small lakes. The disturbances that are being studied include storm surges, thawing permafrost slumps, failing drilling sumps and past wildfire. 15 lakes were visited where lake sediments were collected. The research team collected sediment cores from the bottom of lakes near Noell, Jimmy and Parsons lakes. Additional sediment cores were collected in the outer Delta, about 60 km west of Swimming Point. Passive water samplers were also deployed in 22 lakes, to determine if thaw slumps are releasing contaminants into the lakes. Algae preserved in the sediment are being analysed to determine how biological communities are impacted by these disturbances.

Our research from the outer Delta is proving to be very exciting. Several sediment cores were collected, to specifically examine the past history of storm surges in this area. Remarkably, the analyses indicate that a storm in 1999 had the most damaging impacts on the algae communities during the past 1000 years, changing the algae from freshwater species to saline/brackish species. These lakes are no longer freshwater lakes and it is unclear how long it will take for them to recover to their pre-storm conditions, if a recovery ever occurs.

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File Number: 12 404 321
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Region(s): IN, GW **Location:** Parsons Lake

Land management problems in hydrocarbon development areas with ice-rich permafrost: detection and assessment

Geophysical and thermal investigations of ice-rich permafrost were performed in an area of planned hydrocarbon development at Parsons Lake, Northwest Territories. The Program of Energy and Research Development (PERD) funded this research, to acquire more knowledge regarding the current and future state of permafrost at this site. Information on ground temperatures and material properties are available from a 2004 winter drilling program.

In this study, the application of ground-penetrating radar (GPR) and capacitively-coupled resistivity (CCR) to detect varying forms of ground ice was tested. Since ground ice is an important factor affecting the level of disturbance initiated by thermokarst, improving the use of geophysical tools to map its nature and extent is important. It was found that the observed resistivity of massive ice ranged from 25,000-40,000 ohm-m. Conversely, values for ice-rich peat oscillated around 9000 ohm-m. The GPR cross-sections were applied to provide more detailed information on cryostructure and contacts between massive ice and gravelly sand deposits. It was found that CCR generates similar outputs for the materials.

One-dimensional thermal models were constructed at undisturbed borehole locations. Thermal outputs were produced and compared with the observed data to assess the acurracy of the models. When these models were used to project maximum active layer thickness changes from 2011-2070, subsidence is shown to begin as early as 2058. At disturbed locations, CCR surveys conducted in winter reveal potential taliks beneath the gravel pads.

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File Number: 12 404 570 **Licence Number:** 14654
Region(s): DC **Location:** Within the Scotty Creek drainage area

Landscape change resulting from permafrost melt in the lower Liard River valley: implications for stream flow in the region

The long-term goal of this research project is to develop a suite of models for predicting the response of discontinuous permafrost in the Hay River Lowland to climate warming and human disturbance from oil and gas exploration, and the consequent change in land cover and river flow regime. Our research includes the following activities:

1) The spatial distribution of permafrost and its change over the past 60 years was mapped using aerial photography and satellite images.
2) Conceptual and mathematical models of hydrological processes have been developed;
3) A new model of permafrost was developed to simulate permafrost response to climate warming and human disturbances.

4) The hydrological model was coupled with the permafrost model to predict the spatial distribution of permafrost and the river flow regime under possible scenarios of climate warming and human disturbance.

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File Number: 12 404 745
Region(s): IN
Licence Number: 14740
Location: All Darnley Bay Resources (DBR) land holdings near Paulatuk

Darnley Bay Resources Ltd. 2010 - 2012 field program

This summary covers the first year of a three-year program of exploration for metals and diamonds in the Paulatuk area.

Ground Geophysical Surveys were conducted. Magnetic surveys over 11 targets, gravity surveys over 8 targets, and electromagnetic surveys over 3 targets were completed. The results were used to improve the definition of airborne survey responses, in order to better locate and prioritize drill targets.

Kimberlite/Metals Drilling was conducted. Five drill holes on the Parry Peninsula and four kimberlite pipes were targeted. Three kimberlite pipes were intersected. There was sufficient kimberlite intersected on two pipes to send to CFM Laboratories in Kelowna for assay of kimberlite indicator minerals and microdiamonds. The core was examined by the Northwest Territories Geoscience Office in Yellowknife.

Two drill holes were completed for metals, southeast of Paulatuk, and a third is underway south of Paulatuk at the time of writing. The first hole on an electromagnetic target was terminated after 161 m of overburden, due to technical difficulties. The second hole on a magnetic target was terminated after 153 m of overburden and 231 m of Precambrian sediments, due to technical difficulties. Two or three targets will be drilled by November 30, 2010, depending on progress.

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File Number: 12 404 751
Region(s): IN
Licence Number: 14754
Location: Green Cabin, Banks Island and Mould Bay, Prince Patrick Island

Thermal state of permafrost

During the 2010 field season, the research team visited the research sites on Banks ("Green Cabin") and Prince Patrick ("Mould Bay") Islands. Air and soil temperature and soil moisture data was collected from the data loggers that have been collecting these data since the last visit in 2007. In order to improve the observation process and data access, an Iridium 9522B Satellite Transceiver was installed for real-time data transmitting at these remote sites. At this time, the system works in a testing mode. The real time data for these two sites are accessible through these links:

http://permafrost.gi.alaska.edu/node/555/RealTimeData and
http://permafrost.gi.alaska.edu/node/605/RealTimeData .

Four additional temperature sensors were also installed at both sites, which increased the depth of our measurments to 3 metres. The research team was not able to visit the site at Isachsen, because of a bad weather. Collected data show that mean annual permafrost temperatures in 2010 increased at these sites by 2°C compared to the 2005-2006 period. The real-time data also show that the 2011 summer is warmer than the long-term mean, and the active layer depth is already deeper than 80 cm at the Green Cabin site and is between 50 and 60 cm at the Mould Bay site.

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File Number: 12 404 657
Region(s): IN, GW, SA, DC

Licence Number: 14686
Location: Eighty-two locations on a transect across the NWT, from near Trout Lake to the arctic coast close to Tuktoyaktuk

Permafrost monitoring and collection of baseline terrain information in the Mackenzie Valley Corridor
Permafrost monitoring sites throughout the Mackenzie corridor (Inuvialuit, Gwich'in, Sahtu, and Dehcho regions) were visited in August and September 2010, to acquire ground temperature and active layer data. This included increasing the data record for 40 monitoring sites established in 2007-2008, allowing a better characterization of the permafrost conditions. The enhanced data record is essential to understand the natural variability in permafrost thermal and active layer conditions and to ensure adequate baseline knowledge of permafrost conditions to support land management decisions in the region. Our results continue to show that permafrost in the discontinuous permafrost zone, which covers a large portion of the corridor, is generally warmer than −2°C. Permafrost temperatures have generally increased over time and continued maintenance of monitoring sites and data collection is planned to better characterize the impact of climate change on the permafrost environment. These data have also contributed to an IPY project and an international database with data available online (www.gtnp.org). A detailed report, including graphical and tabular summaries of data, is currently being prepared and will be sent to relevant organizations in the region.

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File Number: 12 404 548
Region(s): SA, NS, SS

Licence Number: 14677
Location: Existing stations: CTLN at Castor Lake ; GALN at the Gamètı airport ; and ROMN

Teleseismic studies in the Wopmay

During the summer of 2010, four new seismic stations were installed at the Colville Lake and Kukluktuk communities, at Simpson and Lake, at Lac du Bois, and on Ellef Rignes Island. A collaborator from Scotland established 6 new stations on Ellesmere Island north of Eureka. The three existing stations in the Gamètı area and at the Jericho Mine were removed. Nine stations were maintained in the East Arm, Great Slave Lake region. All active stations successfully recorded more than 100 distant earthquakes in 2010. Analysis of the additional data from the East Arm continues to suggest that mantle rocks associated with the Slave block to the northwest dip southeastward to perhaps 100 km depth. The Great Slave shear zone is not a vertical structure, but instead involves inter-wedging of crustal and mantle blocks at several depth levels. Interpretation of similar, older observations from Lac de Gras continues to provide new ideas about how kimberlites erupt.

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File Number: 12 404 636 **Licence Number:** 14632
Region(s): IN, GW **Location:** Inuvik

PolarDARN - the northern hemisphere polar portion of the international SuperDARN (Super Dual Auroral Radar Network) program

During the 2008-2010 period, the two PolarDARN radars at Inuvik and Rankin Inlet proved to be two of the best radars in the entire SuperDARN network, because the sunspot cycle was in a 3-year minimum in 2007, 2008 and 2009. As a result, the majority of radar echoes were at the high latitudes seen by the Inuvik and Rankin Inlet radars.

The PolarDARN radars have continued to be very good radars for echo occurrence. There were some signs of the startup of the new sunspot cycle 24 in 2010, and increased echo activity was seen by the auroral zone radars at King Salmon (Alaska), Kodiak (Alaska), Prince George and Saskatoon.

The quiet sunspot period provided an ideal situation for our group to formulate a new "reconnection" model, that predicts the patterns of motion that the PolarDARN radars would see during periods when the Interplanetary Magnetic Field (IMF) carried by the solar wind from the Sun to the Earth has a northward polarity. A new cycle, called the "interchange cycle," was proposed, and the PolarDARN and SuperDARN radars were used to check whether the predicted patterns were observed. The project was very successful and the PDF versions of five major papers that have been published in the 2008-2010 period was sent to ARI. A recent trip to Baffin Island by a SuperDARN Engineer has identified a site at Clyde River, where a third PolarDARN radar is planned for 2012. This radar will not only support the Inuvik and Rankin PolarDARN radars, but also a new Incoherent Scatter Radar RISR-C being built at Resolute Bay. As can be seen, the PolarDARN initiative continues to thrive and grow.

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File Number: 12 404 319
Region(s): IN
Licence Number: 14691
Location: Inner and outer Mackenzie Delta

Geological conditions affecting industrial and community development in the coastal and nearshore regions of the western Canadian Arctic - year 4/4

Our 2010 program included the following: the last of a series of annual breakup surveys begun in 2005; a summer seabed survey off the front of the delta and in outer delta channels; and a continuation of work on delta subsidence, erosion and flooding hazards. The spring breakup program (April 27 to June 12) included satellite remote sensing and field observations, in support of the daily *Mackenzie Delta and Nearshore Spring Breakup Newsletter*, prepared by Steve Solomon. Time-lapse cameras, water-level gauges, and current meters were installed in the outer delta and on/under the ice. Frequent overflights provided photo documentation of breakup progression, water expansion over bottomfast and shoreface floating ice, water drainage through cracks and holes in the ice, and flooding of the outer delta. Water samples and current measurements were obtained, to support understanding of sediment transport during the spring flood. As in the previous two years, a shallow marine survey was carried out in early June immediately after breakup, to document the extent, number, and size of strudel scour pits attributed to drainage of over-ice flood waters. The summer survey program (August 4-28), using the catamaran *Beaufort Explorer*, focused on seabed scour and sediment dynamics, including strudel scour, ice scour, sediment transport by waves and currents, fluid muds on the inner shelf, and the existence and location of the estuarine turbidity maximum. This included measurements of waves, currents, and suspended sediment concentrations, and mapping of seabed sediments and scour features with interferometric sidescan sonar. The onshore summer program (August 19-31) included the following: repeat GPS measurements on survey monuments; preliminary microtopography measurements, to enable future determination of shallow subsidence and sedimentation rates on the outer delta; shallow cores collected to measure sedimentation rates using Cesium-137 dating; and surveys of channel bank, lakeshore, and delta-front erosion and retreat. Data analysis and report writing are in progress.

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File Number: 12 404 535
Region(s): NS
Licence Number: 14796
Location: The upper reaches of the Baker Creek basin

Investigations of the water cycle and hydrological processes of the subarctic Canadian Shield

Field activities, in 2009, in the Baker Creek research catchment began with spring snow surveys and the activation of climate towers and water level stations in April. With the end of the International Polar Year, there were no people living and working in the research catchment in 2010. However, there was an expansion of other research activities. Along with the continued remote measurements of meteorological conditions, evaporation, soil moisture and streamflow, a hydrochemistry sampling program was begun. This program involved bi-weekly sampling of streamflow in tributaries and at lake outlets along Baker Creek. Groundwater was also sampled. Samples were analyzed for ions, pH, metals, nutrients, carbon and nitrogen. This work will determine how stream chemistry and frozen ground relate to wetter autumn conditions during freeze up. These research questions are in response to observations that the hydrological regime of small subarctic Canadian Shield catchments may be changing from a predominantly nival (snowmelt) to a combined nival/pluvial (snowmelt and rainfall) regime. The autumn of 2010 was relatively dry, and the annual streamflow response was typical of a nival regime. Hydrochemistry and streamflow data are just now being analyzed.

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File Number: 12 404 757
Region(s): IN
Licence Number: 14778
Location: Beaufort Sea

UpTempO: measuring the upper ocean temperature of the Arctic Ocean
One UpTempO buoy was deployed from the Canadian Coast Guard ship, the Amundsen, in September 2010. The ocean thermistors on the buoy failed immediately. A second buoy planned for deployment was instead shipped back to the manufacturer, MetOcean company, in Dartmouth, NS. Engineers at MetOcean discovered a poor seal around the thermistors. Thus there is no data from 2010. The seal was improved over the winter, and the research team plan's to deploy two more buoys from the Amundsen in summer 2011.

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File Number: 12 404 673
Region(s): NS
Licence Number: 14657
Location: Tibbitt-to-Contwoyto winter road

Diamonds and oil from the tundra: a system study on the impact of changing seasons on mining and oil exploration
Our goal is to understand how changes in the seasons, particularly the shortening of winter, might impact the economics of the north. In Canada, the focus was on the impact of ice road seasons on diamond mining. The research team observed how environmental data is collected in the field, how it is utilized by regulatory agencies to make decisions, and how businesses weigh climate impacts with other factors in their operations. Based on the studies, the impact of climate-driven changes in seasons were isolated from all other factors. The outcome of the project will be explicit information on the extent to which climate-driven changes in seasons are affecting tundra opening and closing and ice road use. More generally, it will be a methodology, including modeling, to distinguish climate drivers from non-climate drivers for uniquely northern businesses.

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File Number: 12 404 730
Region(s): IN

Licence Number: 14680
Location: The targets will be chosen within the general offshore petroleum lease areas, from 70 to 73 degrees N and 128 to 140 degrees W

Canatec ice drift beacon field test

To carry out a trial to see how the instrument works over several months in a real field environment. The drift beacon is described fully in the product specification sheet, a copy of which is attached to the communication to the EISC. It is an Iridium satellite beacon with a GPS receiver and a power supply of 36 AA batteries. The batteries are Lithium-ion, available for purchase in most retail stores. In terms that are relevant to an environmental assessment, it is equivalent to a cell phone and a big flashlight put inside a small plastic box. Beacons identical to this were put out on the ice in the Beaufort last year. Our beacon is smaller and does not have hazardous batteries.

The research team will charter a Twin Otter in late January or early February 2010 from Inuvik and fly out over the target area. Four beacons will be deployed by parachute from the plane at 500 feet.

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File Number: 12 404 720
Region(s): NS

Licence Number: 14793
Location: Wekweètì

Wind energy monitoring in Wekweètì: 2010 - 2012

In order to better quantify Wekweètì's wind energy resources, a 34 meter wind monitoring tower was installed on a hilltop near the community, in October 2010. Also, a 10 meter turbine/monitoring tower was installed near Wekweètì's anticipated new complex, to displace the building's electrical load and to provide additional data for this project. Data concerning wind speed and direction will be collected for two years, to support a wind energy feasibility study for the area. Preliminary results will be reported to the community after one year of data has been collected, and a final report will be produced at the end of the two year study.

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File Number: 12 404 720
Region(s): NS

Licence Number: 14634
Location: Thor Lake Mine Site

Wind energy monitoring at Thor Lake 2009-2011

In September 2009, a 50-meter wind monitoring tower was installed near Hearne Channel, to assess the wind energy in the Thor Lake area. One year of wind data was analysed, and a summary report was submitted on the initial findings. A second year of wind data will be collected in 2010/2011.

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File Number: 12 404 720
Licence Number: 14633
Region(s): IN, GW
Location: Within the municipal boundaries of the Town of Inuvik

Northern native seed development field trials
No research was conducted under this licence.

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File Number: 12 404 709
Licence Number: 14700
Region(s): IN, GW
Location: Mackenzie River Delta

RADARSAT observations of river ice and flood patterns in the Mackenzie River Delta
This project aims to develop the potential of Canada's RADARSAT satellites to map and monitor river ice freeze up and breakup patterns in the Mackenzie River Delta. Fieldwork facilitates the correct interpretation of RADARSAT images and the generation of reliable information products. In 2010, fieldwork was carried out from April 20 to May 6. Information concerning the location and extent of bottomfast ice (BFI) was collected at sites where the presence of BFI was expected, based on visual analysis of RADARSAT images. BFI typically shows in RADARSAT images as dark areas of low backscatter. The presence, or not, of BFI was ascertained in the field by means of augering and GPR measurements. Information on the distribution of BFI supports the hydrodynamic modelling work by partners from the University of Alberta. Our findings reveal a potential for confusion between BFI and snow covered dry river beds or ice with saline impurities (e.g. ice cover on some lakes in the outer delta). Using the available combination of RADARSAT images and ground reference data, a prototype map showing the distribution of BFI at selected locations in the Mackenzie River Delta was produced and distributed among research partners.

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File Number: 12 402 810
Region(s): SS

Licence Number: 14698
Location: 2008 wildfire near Sandy lake and 100m west of territorial Highway 5, just north of Wood Buffalo National Park

Ecohydrologic impacts of wildfire on peatlands
No research was conducted under this licence.

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File Number: 12 404 740
Region(s): IN

Licence Number: 14720
Location: Mackenzie River, Inuvik

Towards long-term monitoring of the CO_2 system in arctic rivers
The research team has completed two field sampling campaigns in June and September 2010, in the Mackenzie River near Inuvik, NT. In addition, monthly river samples were collected from the Mackenzie River at Inuvik by the technicians at Aurora Research Institute (ARI). All sampling was very successful. The research team have collected a total of approximately 60 water samples. All samples will be measured for total dissolved inorganic carbon (DIC) concentration and alkalinity. About half of the samples have been processed, and the results are promising. The principal investigator will continue processing the samples, and maintain monthly sampling into 2011 with help from ARI. The available data show significant daily changes in DIC concentrations and alkalinity in the east channel of the Mackenzie River at the Inuvik Dock. From DIC concentrations and alkalinity, pH and the partial pressure of carbon dioxide (pCO_2) in the river water can be calculated. The results also show large daily changes in pH and pCO_2, suggesting that living organisms may be very active throughout the day. The principal investigator also found that there is a small but significant difference in DIC and alkalinity between the main channel and the east channel of the Mackenzie River. Once all analyses are complete, there will be a clearer picture of carbonate chemistry and how climate change may affect carbon biogeochemistry in the Mackenzie River.

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File Number: 12 404 549

Licence Number: 14741

Region(s): NS

Location: Along the highway west of Yellowknife, along the Ingraham Trail east of Yellowknife, and within the Baker Creek Watershed north of Yellowknife

North Slave permafrost study: characterizing and predicting discontinuous permafrost for climate change adaptation

Field work was conducted between June and September 2010, in the Great Slave Lowlands and Uplands along Highway 3 and Highway 4. The purpose of the field work was to collect data on local permafrost conditions in varying ecological settings, to improve baseline data and predictions from modelling and remote sensing. Permafrost core samples ranging in depth from 1.4 to 5 metres were obtained from 14 sites in peatland, spruce forest and birch forest ecological settings. Thaw depths, soil depths, soil types and moisture contents were determined from collected samples. Grain size, water geochemistry and geotechnical tests will be conducted on the samples. Ecological and permafrost characteristics (including active layers) were described for 48 sites, which are to be used for an undergraduate thesis study and as control points for potential remote sensing mapping. Active-layer temperatures were monitored from one birch, one spruce forest and four peatland sites. Ground temperatures were also monitored, including three burn sites and a total of eight peatland, birch and spruce forest sites. In addition, six air, six active-layer, seven shallow-water, and four lake-bottom temperature monitoring sites were established, to understand potential climatic gradients and the effects of water on local permafrost conditions.

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File Number: 12 404 760
Region(s): NS

Licence Number: 14828
Location: Northwest Territories Power Corporation's, Frank Channel Substation near Behchokò

High-precision atmospheric carbon dioxide and methane measurements at Behchokò, NWT

No research was conducted under this licence.

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File Number: 12 404 711
Region(s): IN

Licence Number: 14648
Location: Sixty study lakes located in the regions close to Noell Lake, Parsons Lake and on Richards Island

Hydro-ecological responses of arctic tundra lakes to climate change and landscape perturbation The goal of this work is to understand and model the effects of changing climate, using permafrost degradation as an analogy for changes under a warming climate, on the supply of nutrients to tundra lakes, and on the biological communities within those lakes. In 2010, our field investigations included a lake ice survey on Noell Lake in early May when the ice was at its thickest. The research team also sampled chemical and physical water properties and food-web biology in two small lakes draining into Noell Lake in late June, late July, and early September. In late July, 25 additional tundra ponds and lakes were also sampled.

Analyses completed so far indicate that hydro-climate controls permafrost degradation, and in turn, the water chemistry impacts of permafrost degradation determine the limiting factors for phytoplankton growth in these lakes. In other words, there is bottom-up control on food-web structure and productivity. Further analyses are underway to complete the full picture before final results and conclusions are made.

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File Number: 12 404 711
Region(s): IN
Licence Number: 14650
Location: Noell Lake, two small lakes to the west of Noell Lake, three lakes west of Parsons Lake, and six lakes on Richards Island

First amendment - hydro-ecological responses of arctic tundra lakes to climate change and landscape perturbation

Through our on-going investigations on small arctic lakes, it became evident that some food-webs may include very small fish, such as stickleback and pond smelt, as a top-down control on the food web structure and/or productivity. In 2009, this research component was added to our overall research program, to determine if any of the small lakes that were studied contain fish. The research team found that 7 of the 11 lakes visited did indeed contain fish. In 2010, the research team visited some of these lakes again, to collect additional samples of some fish species and increase their overall sample size for analyses. 15 "new" lakes were also visited, which were not sampled last year, that drain into Noell Lake, in order to enhance our investigations of the effects that small lakes draining into Noell Lake have on the Noell Lake food-web. Of these 15 "new" lakes, 4 lakes were found to contain fish – one contained northen pike, one both northen pike and ninespine stickleback, and 2 contained ninespine stickleback only. Samples of the fish and other parts of the food-web are currently being analysed in the laboratory to determine the structure and function of the food webs in these lakes (i.e. who eats who).

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File Number: 12 404 711
Region(s): IN
Licence Number: 14651
Location: Noell Lake

Noell Lake ice study - 2nd amendment to hydro-ecological responses of arctic tundra lakes to climate change and landscape perturbation

The objective of this research is to improve knowledge on lake ice and its effect on food webs and productivity in small arctic lake systems, in order to better predict changes that could occur under changing climate. In late September 2010, prior to freeze-up, an automated ice buoy and subsurface mooring system was deployed in Noell Lake, for continuous monitoring of weather conditions, lake ice conditions (i.e., formation, growth over winter, breakup in spring), light penetration into the lake (i.e., through the ice in winter), and water quality. The installation was successful and data are now being collected by the system and transmitted in real-time, via satellite to a computer station located at the University of Victoria. These data will allow us to examine lake ice and its effects on the food web and lake productivity through the winter, as well as the character of food webs and lake productivity during the ice-free season.

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File Number: 12 404 711
Region(s): IN

Licence Number: 14711
Location: More than 60 study lakes located in a transect north of Inuvik, NT, lakes located at the coordinates 68.55117 ºN, -133.63983 ºW.

Lake 5A mesocosm study - 3rd amendment to hydro-ecological responses of arctic tundra lakes to climate change and landscape perturbation

The overall objective of this study is to better understand the impact of permafrost thaw shoreline slumping (an analogue for a warming climate) on the bottom components of aquatic food-webs in small arctic tundra lakes, in order to better predict the effects of a warming climate on food-web structure, function and productivity. In June 2010, 12 small temporary mesocosm enclosures (box-like enclosures) were placed into a small lake draining into Noell Lake. The enclosures had differing amounts of shoreline slump material added to see what effect the sediment additions had on water chemistry/physical water properties, and on the bottom levels of the food-web. The enclosures were sampled once each week from early July to early September. The samples are still being analysed in the lab, and results from this study are forthcoming.

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File Number: 12 410 857
Region(s): NS
Licence Number: 14737
Location: Yellowknife

Housing and being homeless in Yellowknife
This project aims to provide an overview of government-assisted housing in the NWT, both past and present, as well as homelessness in Yellowknife. Its focus is on the policies, programs, laws and regulations, as well as the economic factors, that are relevant to these themes.

The purpose of the study is to assess affordable housing problems and homelessness in the NWT, to publicize them, and to develop practical recommendations that will address problems related to housing affordability and homelessness. The research will have a minor comparative dimension, contrasting government-assisted housing and homelessness policies and programs in the NWT with those of other Canadian jurisdictions.

Over 40 semi-structured, in-depth interviews (telephone when appropriate, and in-person) have now been conducted with housing providers, community workers, public servants and other experts, to develop a preliminary understanding of the main factors affecting affordable housing in the NWT, and homelessness in Yellowknife. They generally lasted between 30 and 90 minutes. All interviews were recorded by the researcher with pen and paper and are confidential

Three main publications are expected to come out of this research:
1. A present-day article on government-assisted housing in the NWT, which has been accepted for publication in "How Ottawa Spends, 2011-2012: Life Under the Knife (Again)", published by McGill-Queen's University Press (Montreal). An early version of this article has already been circulated to our northern collaborators.
2. A present-day policy paper looking at homelessness in Yellowknife. An early version will be circulated to our northern collaborators in November 2010.
3. An historical article on government-assisted housing in the NWT. An early version will be circulated to our northern collaborators in March 2011.

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File Number: 12 410 874
Region(s): NS
Licence Number: 14769
Location: Yellowknife

Marketing plan for Canadian Parents for French (CPF)
The objective of this project was to ascertain what activities parents with children in French programs would like to see in the upcoming 2010-2011 school year, and to create a marketing plan for Canadian

Parents for French (CPF) to encourage new volunteers to sit on the Board and help out with these activities throughout the year. CPF is an organization made up of volunteer parents with children enrolled in French language programs in Yellowknife schools. They are committed to encouraging French language activities outside of the school system, in order to support children who are taking French as a second language.

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File Number: 12 410 868
Licence Number: 14697
Region(s): IN, GW
Location: Aklavik

Aklavik health promotion research project

This community-based research project was a masters project, conducted by a graduate student from the Faculty of Anthropology at the University of Toronto. The project asked people in Aklavik to share their knowledge of the meaning of health, barriers to health, and ways to improve health in their community. The research was designed and conducted over many months of partnership between the graduate student and the Aklavik Health Committee, with financial and logistical support provided by the Public Health Agency of Canada and the Institute for Circumpolar Health Research.

A random sample of 30 community members was interviewed for the study. Interviews were followed by three focus groups, to discuss interview questions and community responses. The research team found that many people in Aklavik define health in terms of healthy eating, physical activity, social wellbeing, mental health, and addictions. When asked to identify the biggest barriers to health in their community, people prioritized the price of food, the cost of accessing country food, the price of housing, the prevalence of alcohol and addictions, and limited access to mental health and addictions services. Participants also proposed ideas for improving health in their community, including more community gatherings and health education, improved access to healthy foods and nutrition, programs to help people get out on the land, and expansions to mental health and addictions services. Many participants showed little interest in research, but some showed interest in research on the H. pylori stomach bacteria, addictions, health education, the price of market food, and the communication of existing research using community radio. Overall, the results highlight community perceptions of the social determinants of health, and reaffirm the importance of community partnerships as a basis for designing strategies to improve public health in rural and northern communities.

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File Number: 12 410 871
Licence Number: 14755
Region(s): SA
Location: Délı̨nę

Land use as management: re-imagining the Délınę Renewable Resource Council in an aboriginal self-government era

This project builds upon recent doctoral research with the Délı̨nę Land Corporation and Délı̨nę Renewable Resource Council (DRRC) on the Great Bear Lake Watershed Management Plan (GBLMP) and protection of the Saoyú-ʔehdacho Aboriginal cultural landscape (S-E). For that ethnographic research, the principal researcher lived in the community from 2003 to 2006 and participated as a member of the formal GBL and S-E working groups. More broadly, this research is also a continuation of commitment to collaborative, community-based management and research. Strong research relationships are central to practical outcomes that contribute to improving community land management practices, as well as to a broader understanding of governance and resilience in practice. This research originates out of the principal investigator's experiences and the deeper understanding derived from working over a number of years with DRRC members on doctoral research. Through a process of preliminary field-work, this proposal was initiated and developed based on two meetings in Délı̨nę in 2009 with DRRC leaders and Délı̨nę Self- Government leadership. Through the examination of historical and contemporary challenges that the DRRC has faced, and is facing, this collaborative research seeks to understand local level natural resource management and governance issues, as northern communities transition to aboriginal self-government amidst industrial resource development and caribou population decline concerns. A key objective of the research is to provide practical guidance to local leaders, in which decision-making incorporates valuable local knowledge.

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File Number: 12 410 886
Region(s): NS
Licence Number: 14829
Location: Yellowknife campus, Aurora College

Quality workplace environment

No research was conducted under this licence.

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File Number: 12 410 867
Region(s): SA
Licence Number: 14694
Location: Norman Wells, Tulít'a, Délı̨nę, Colville Lake, and Fort Good Hope

The association between career and technical education programming and secondary school student attendance rates

In the 2005/2006 school year in Canada, the dropout rate for secondary school students in isolated communities was 47% higher than the national average. Currently, little research has sought to determine factors contributing to student dropout rates in isolated communities. This mixed methods study was constructed using Gardner's multiple intelligence theory as a theoretical framework, in order to inform educators about the connection between career and technical education courses and secondary school attendance rates,. The research question sought to determine how career and technical education programming can increase secondary school student attendance rates. This study was also conducted to uncover, through the voices of the participants, the students' perception of career and technical education programming and the connection between attendance rates and student enrollment in career and technical education courses. The researcher collected quantitative data through student attendance reports and student responses on a survey questionnaire, while qualitative data was collected through student interviews. The key results of the study were that secondary school students attended school more frequently while enrolled in career and technical education programming and they perceived an increased level of engagement and motivation through participation in career and technical courses. The implications for positive social change include an increased understanding of how integrating career and technical education programming in secondary schools in the Northwest Territories can increase student academic success and graduation rates.

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File Number: 12 410 877
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Location: Fort McPherson

Fostering trust and capacity in the Tetlit Gwichin Band Council

This research found that fostering enhanced levels of trust and capacity within the organization will improve relationships between staff and council overall, as well as the relationships between the organization and its membership. Even though there is already an element of trust within the organization, efforts to enhance current levels would greatly improve organizational efficacy and ongoing organizational development. Highlights of the research suggest that to enhance trust, the organization needs to improve communication, develop assertiveness and personal skills in staff and council and develop a clear and well defined human resource policy. In terms of capacity, the organization feels it lacks the necessary skills and abilities to manage the programs and services they now deliver. The research indicates that for the organization to be effective, staff and Council need to be vigilant in their efforts to identify areas within the organization where these gaps exist; some can be addressed in-house, by making minor adjustments and others will require more in-depth planning and development. The research showed that developing enhanced levels of trust and capacity will greatly improve the transparency of the organization and prepare the organization for further organizational renewal.

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File Number: 12 410 881 **Licence Number:** 14801
Region(s): NS **Location:** Ndilo and Dettah

The effects of a changed climate and environment on the nutrition and health of Dene First Nations In the spring and summer of 2010, the Principal Investigator traveled to Yellowknife, NWT, Canada and began her research. Twelve participants were consented into the study and interviewed per the study's protocol. The Principal Investigator is currently transcribing and analyzing the data.

The Principal Investigator will return to Yellowknife, NWT, Canada in the summer of 2011, to share the initial results with the community and collect additional data. The Principal Investigator will reside in Yellowknife for 2 months, then return to the U.S. and continue analyzing the data. In the fall of 2011, the investigator expects two-thirds of the analysis to be complete and will return to Yellowknife to present the results and collect additional data, if necessary. The goal is to complete the data collection in 2011, present the final product (results) in early 2012, and exit the study.

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File Number: 12 410 885 **Licence Number:** 14818
Region(s): SS **Location:** Fort Resolution

Linking place identity, environmental change and adaptation in the context of changing water conditions in Fort Resolution, NT
During field work in November/December 2010, the principal researcher conducted interviews about how water may be changing in the Slave Delta, Great Slave Lake and other waterways in the South Slave Region, as utilized by residents of Fort Resolution. Two community researchers were hired to assist with interviewing 10 Elders and 6 environment staff. Preliminary results indicate serious concerns about a lowering water trend in the region, as well as concerns over contamination of water sources from development within and outside of the territory, including from oil sands development, mining and hydroelectric activities. Impacts to the ability to use and travel the land, and consumption of traditional foods were noted by the majority of participants.

One round of the photo project was completed with the Grade 7 class at Deninu School. All students had the opportunity to participate and use the camera equipment; only those students who signed the consent forms, and whose parents also signed consent forms, will have information included in the project. Students wrote stories to accompany the photos they took . Results show youth are concerned about contamination issues mostly, and the impacts to fish in the region from upstream development. A summary of field activities was submitted to community organizations.

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Region(s): NS **Location:** Yellowknife

"Developing" aboriginal youth?: an examination of the NWT aquatics program
In August 2010, the research team conducted archival research on former pool reports and government documents pertaining to the Northwest Territories Above-Ground Pool Program. To date, the research have begun the process of documenting the program's history. Forexample, identifying the communities in which the program operated, the program's past objectives and initiatives, and leadership training programs. Over the next few years, the hope is to add to this history by putting it into conversation with past research findings, adding information through the further collection of documents and through conducting interviews with past employees. At the moment, the project is in the very preliminary stages of the research and thus have no formal results to report.

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Region(s): IN, GW, SA, DC, NS, SS **Location:** All NWT

Subjective well-being and Canadian social work
Following a previous quantitative study on the subjective well-being (the social scientific concept for happiness) of social workers practicing in northern Canada, this follow-up qualitative study investigated further aspects about the profession, personal life, and work environment that contributed to practitioner well-being. Data were collected using one-on-one interviews with 21 social workers practicing in the Northwest Territories and north-western Ontario. That completed the initial quantitative study. Data were analysed using analytic induction methods and constant comparison strategies to identify emergent themes and patterns.

Four primary themes in relation to practitioner well-being emerged:
1) aspects of the intra-organizational context of practitioner workplaces (i.e., aspects of team dynamics, decision making, management/supervisory dynamics, workload and workplace expectations, access to resources/infrastructure/support, and inter-organizational relationships);
2) professional expectations of the social worker and those held of the profession (i.e., outcomes, roles of practitioners, social worker identity, and working in adverse situations);
3) characteristics and factors in the local environment (i.e., socio-spatial and socio-political contexts); and
4) the intersection between the personal and professional aspects of the social workers' lives (i.e., interpersonal dynamics, intrapersonal dynamics, personal in the profession, and profession in the personal).

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Region(s): IN, GW **Location:** Inuvik

Vocational education and training partnerships in northern Canada
Print sources of information (i.e., government documents, newspaper articles, aboriginal labour training agreements) have been gathered for this research project. Interviews were also conducted in both case sites (e.g., Alberta and the Beaufort Delta, NWT). While in Inuvik, the principal researcher interviewed students participating in a carpentry program that was offered through Aurora College and supported by the Building Inuvialuit Potential Society Aboriginal Skills and Employment Program. These interviews will then be followed-up in April 2011. During both visits the plan is to also interview local knowledge holders in the community and possibly also visit neighbouring communities as well.

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Region(s): IN, GW **Location:** Inuvik

Community agriculture in the Canadian Arctic- how to help northerners grow food using greenhouses
Food insecurity in Nunavut is very high, because nutritious foods are expensive and inaccessible, due to large travel distances. Additionally, there is a lack of education and awareness around the importance of eating nutritiously. Community agriculture is a possible solution to alleviating some of these predicaments, however little research has been done in this field. The objectives of this research project are the following: to describe the disconnect that Nunavut communities have regarding their food sources; to understand the current community agriculture practices in both Nunavut and the Northwest Territories; and to identify best practices to increasing overall success of existing and future projects.

The Inuvik Community Greenhouse and the Iqaluit Community Greenhouse Society were chosen as case studies. Through site visits to these two locations and key informant interviews with involved members and community stakeholders, the following six themes were identified as leading to a successful arctic community greenhouse: organizational structure, operations, outreach, aboriginal involvement, partnerships, and economics. These two projects demonstrate that food awareness in the community is increasing by working towards bridging the disconnect that so many northerners have with their food sources.

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Location: Wekweètì, Whatì, Gamètı and Yellowknife

Past and future fire dynamics: implications for central arctic caribou and dependent communities (community based component)

Continuing research was conducted in the Tlicho communities during February and March. In Whatì, interviews were conducted with the same Elders as during summer 2009. In Gamètì, a focus group was held with five Elders, and two Elders were interviewed individually. Participant observation was applied as a research method and much time was spent participating in workshops and cultural activities in the communities and on the land. In October, a third research trip was done. In Gamètì, two interviews were conducted. In Whatì, the Elders who participated were given a copy of their transcribed interview and the research report . Copies of all transcribed interviews and the research report were given to the community governments to be stored in their archives. The research report was distributed to community leaders.

Expanding on the research from 2009, the documented Tlicho knowledge on forest fires became linked with climate change. Further indicators of climate change were documented: a general increase in temperature; an increased snow base; thinner and unsecure ice; a decrease in wind; and a general drier forest due to lack of rain and warmer temperatures. Additionally, impacts of these climate change indicators on hunting and travelling on the land were documented: changes of hunting locations, modified time for hunting, uncertain weather predictions when travelling on the land, and an increased focus on safety.

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Location: Yellowknife

Effectiveness of community consultation information: a case study of the Giant Mine remediation plan

The overall research question is "Did the information provided to stakeholders (and other interested and affected parties) about the Giant Mine Remediation Plan allow them to equally and fairly participate in the consultation process?" Specific objectives of this research were:

1) To review available documents on the Giant Mine Remediation Plan, and assess these in terms of accessibility, content and ease of understanding;

2) To understand stakeholder perspectives on the information provided to them on the Giant Mine Remediation Plan;

3) To identify the key sources of information for stakeholders through their information seeking behavior; and

4) To provide recommendations on: (a) the nature and type of information required by stakeholders to participate in consultation processes about contaminant issues; and (b) what is needed to provide stakeholders with the capacity they need to equally and fairly participate in these processes.

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Location: Inuvik and Tuktoyaktuk

A case of access: Inuvialuit engagement with the Smithsonian's MacFarlane Collection

The MacFarlane Collection, housed at the Smithsonian Institution in Washington DC, was purchased by Hudson's Bay trader Roderick MacFarlane, from the Anderson River Inuvialuit during the 1860s. Inuvialuits have had very little access to these objects since they were purchased. This project seeks to facilitate the process of Inuvialuit engagement with the collection through a community-driven process. The 2010 activities of the project included a range of outreach presentations, consultations, and interviews in Inuvialuit communities. In June, our project team presented to community groups and schools in Tuktoyaktuk and Inuvik, and gained feedback about desired directions for the project. In October, our project team assembled for a workshop in Vancouver. At this time, the research team developed an interview kit and were trained in interview techniques. Then, interviews were conducted in English and Inuvialuktun, with thirteen Elders in Inuvik, Tuktoyaktuk, and Paulatuk, about the collection. Work has begun on transcribing and analysing these interviews. Planning for the project website has begun (www.inuvialuitlivinghistory.ca). This website presents a virtual exhibit of the MacFarlane Collection, as well as serving as a dynamic and searchable database of the objects in the collection, including museum records, oral histories, videos, and photographs associated with each artifact. The website will be launched in 2011.

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Location: Délı̨nę, Fort Good Hope, possibly other Sahtu communities

Addressing internal challenges and barriers to enhance the representation of aboriginal values and interests in regional land use planning

In the Northwest Territories, land claims created co-management boards, as a way to share power between aboriginal organizations, the territorial government, and the federal government. Land use planning in the north is carried out by such co-management boards. Land use planning is supposed to be community driven and give communities a greater voice in land and resource management but aboriginal organizations and communities have difficulty participating at the same level as governments. Where governments have teams of technical people, lawyers and even planning staff, communities struggle with much smaller budgets and often no technical or legal staff.

I looked at the Great Bear Rainforest (GBR) agreement in British Columbia and considered it as a "success" case for aboriginal participation in land use planning. 17 interviews were conducted with aboriginal leadership and non-aboriginal people in the GBR, Dehcho, and Sahtu regions. The interviews provided "lessons learned" on ways to encourage aboriginal participation. Interview participants identified three main areas where leadership could work to encourage participation in land use planning: Leadership can help make the technical planning process better; leadership can demonstrate strong leadership; and leadership can adopt good governance practices and structures.

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Region(s): SA
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Location: Délı̨nę and Tulıt'a

People, land, and pipelines: perspectives of resource decision-making processes in the Sahtu Region, Northwest Territories

No research was conducted under this licence.

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Region(s): NS
Licence Number: 14661
Location: Behchokò, Rae Lakes, Whatì, Wekweètì, and Yellowknife (Ndilo, Detah)

Socio-economic study for the Fortune Minerals NICO project

The objective of the socio-economic study is to collect baseline data to enhance Fortune's understanding of conditions in communities potentially affected by the NICO project. The data was used to prepare documents required by regulators to make decisions about the project.

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Region(s): SA
Licence Number: 14806
Location: Fort Good Hope

Responses to a reduced availability of barren-ground caribou in Fort Good Hope

According to surveys, the population of barren-ground caribou in the Bluenose West herd has declined in recent years, raising the question of how people in communities that rely on the herd for food might be responding. This research looked at community responses in terms of community hunts and food-sharing in Fort Good Hope.

Findings highlight how community hunts in Fort Good Hope adjust to different ecological conditions, such as the availability of animals, and to social circumstances in the community. For instance, community hunts are considered opportunities to visit culturally-important locations on the land that individual harvesters have difficulty accessing. They also are occasions to bring elders and youth together in these important landscapes, creating opportunities for learning between generations. Food-sharing is a critical part of life in many communities, and meat is sometimes accessed through requests made to hunters, while other times hunters and community agencies distribute it. Research findings are that elders, single mothers and 'those in need' are particularly looked after in the distribution of meat, especially after community hunts, although they also seem to make more requests for it. These complex dynamics of sharing are important to understand given fluctuations in food-sources such as caribou.

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Region(s): IN
Location: Aklavik, Ulukhaktok, and Paulatuk

Adaptation planning for climate change in Ulukhaktok, Paulatuk and Aklavik, NWT

Individual and group review sessions for climate change adaptation plans were undertaken in Paulatuk and Ulukhaktok during fall 2010. Feedback was recorded with regard to priority level of actions, plan presentation and format, and status of actions in the community.

In both communities, additional research was undertaken on current and future climate-related threats to infrastructure and possible adaptations. Risks associated with coastal and fluvial erosion, snow drifting, ground subsidence related to permafrost thaw, slope instability and flooding were noted. Community infrastructure working groups underscored the importance of local input into building codes and community development.

Opportunities for pilot initiatives that contribute to adaptive capacity were also developed and include the following: an oral history database in Ulukhaktok, to be developed in partnership with Helen Kalvak School; a local working group in Ulukhaktok documenting concerns and opportunities related to cruise ship tourism for communication to regulators; and a Ladies' Supper Club dedicated to issues related to food security and nutrition in Paulatuk.

In Aklavik, two field consultation trips established a local coordinator, who was involved in preparing for adaptation planning sessions held from Nov 29-Dec 3, 2010. In every community, local people were employed in conducting the research.

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Region(s): IN
Location: Ulukhaktok and Paulatuk

Adaptation planning for climate change and subsistence economies in two Inuvialuit communities

This project worked with community members in Paulatuk and Ulukhaktok, scientists, and policy makers to continue adaptation planning for climate change. Local coordinators hosted follow-up community workshops to discuss the preliminary adaptation documents. Feedback was integrated into the adaptation plans and adaptation actions were prioritized. A landscape scientist worked with public works and housing workers to address climate-related risks affecting community infrastructure. A landscape hazard map was produced for each community with a complementary report. This information will help guide future development in the communities.

In Ulukhaktok, a workshop on cruise ship tourism was held to document community concerns and opportunities related to cruise ship tourism. This information was documented in a report and communicated to policy makers in the federal government. Additionally, an oral history project was developed in partnership with the Inuvialuit Cultural Resource Centre and Helen Kalvak School to help preserve, organize and make oral history accessible to the community (www.nauvikhaq.com).

In Paulatuk, where food insecurity was highlighted as a priority concern, a community kitchen series was piloted, in collaboration with the community counselor and local volunteers. The series presented an opportunity for food-insecure families to learn and prepare new, nutritious recipes, using affordable ingredients (ingredients were free for participants), as well as a space to discuss food security challenges and pose nutrition questions. This initiative received additional support from Beaufort Delta Health and Social Services and the Inuvialuit Regional Corporation.

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Region(s): IN
Location: Sachs Harbour

Arctic contaminants: exploring effective and appropriate communication between Inuvialuit communities and researchers

Following our first trip to Sachs Harbour, in summer 2009, interviews began, in November 2009. Interviews continued during our visit from March to May 2010, totaling 10 to date; additional information was collected through informal discussions. A collaborative survey was conducted to supplement information recorded in interviews. The research team visited again in late October to early December 2010. During this visit, survey results were collected and group workshops commenced, where specifics regarding contaminants and contaminants messages were discussed from a local perspective. Participant verification of information provided in interviews, preliminary storyboarding, and editing began. Subsequent trips in 2011 are anticipated for final editing, video production and presentation. Some delay has occurred, because the project is still in its developmental stages.

Preliminary results indicate that contaminants are perceived as being many things beyond the focus of 'scientific messages'. Research presentations in the community are viewed as positive; 20% of participants could recall learning something about contaminants and were the only ones able to identify specific contaminants being studied by researchers. Additionally, contaminants are not currently viewed as a threat to consuming country foods.

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Region(s): IN, GW
Location: Inuvik

Take it from the top

This year of research has focused on presenting the work to date and finalizing the editing of the video series. The video series should be sent to NWT communities in 2012 and a dedicated website should go live at the same time.

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Region(s): NS
Location: Aurora College, Yellowknife campus

ESL educational techniques

Throughout the research, the principal investigator attended LINC (Language Instruction for Newcomers to Canada) classes at all levels. There were three groups of learners, loosely divided into beginner and intermediate, with classes offered during the day and in the evenings. The principal investigator participated in most of the classes enthusiastically and helped the LINC instructor.

As a result of the research, similarities and differences were found between the English education in Canada and in Turkey. First of all, while English is taught to Turkish people in Turkey, in Canada it is taught to people who migrated to Canada. So, the native language of the instructor and the learners is different in Canada, while it is the same in Turkey. In Canada, students have to communicate in English all the time, despite of their insufficient English. That helps students to improve their speaking and listening skills quickly. On the other hand, in Turkey, instructors teach Turkish in Turkey and students can communicate with instructors in Turkish in the class, while learning English. Secondly, the number of students in LINC classes is from five to ten. However, in Turkey, English classes have more than twenty students. As the number of students grows, the instructor spends less time with each student. In Canada, the small number of students in each class helps students to improve their learning skills. Finally, the English instructor in LINC classes frequently uses body language and visual aids such as pictures, charts etc., so that students improve their vocabulary quickly. The instructor also helps students to improve individually by giving them extra lessons, such as writing and reading. In Turkey, the number of students is too high for personal attention.

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Licence Number: 14676
Location: within each community where the researchers are granted permission to work in the Gwich'in Settlement Area and Inuvialuit Settlement Region.

The genographic project: anthropological genetic analyses of indigenous human populations of North America – Inuvialuit and Gwich'in

In the summer of 2010, the research team met with all Gwich'in band councils and the Gwich'in Tribal Council, to report the project findings to them. They were pleased to receive the summarized mitochondrial DNA (mtDNA) results (female lineages), and indicated their interest in receiving the mtDNA and Y-chromosome (male lineages) test reports, via the project website and by mail. DNA samples from another 10 Gwich'in individuals were obtained, raising the total number of participants to 90.

The research team met with the Inuvialuit Regional Corporation (IRC) during their visit, and reported the results to them. Members of the IRC were pleased to see the genetic data, and several participants checked their results online while the research team were present. The research team traveled to Paulatuk and Sachs Harbour in 2010. DNA samples from 40 Inuvialuit participants were obtained from these two communities, bring up the number of participants to 150 samples in total from this population.

Since this visit to the NWT, the analysis of Gwich'in and Inuvialuit mtDNAs and Y-chromosomes has been completed. The resulting mtDNA data for individuals who provided samples in 2009 and 2010,have been uploaded to the project website. The Y-chromosome data from male participants will be uploaded to the website. In addition, results documents have been prepared describing the mtDNA and NRY results, and began sending them to participants in June 2011.

The research team is currently exploring possible dates to return to the NWT, so that the research can be discussed with the Gwich'in and Inuvialuit communities, and possibly involve additional individuals in the study. Work is also beginning with the Gwich'in Social and Cultural Institute on a tribal genealogy project, and tentatively moving forward with a science curriculum initiative with the GSCI and the GNWT.

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Region(s): SA, NS

Licence Number: 14705
Location: within each community where the researchers are granted permission to work in the North Slave and Sahtu regions

The genographic project: anthropological genetic analyses of indigenous human populations of North America - North Slave and Sahtu Dene

In August 2010, the research team traveled to the Sahtu region. Three days were spent in Tulıt'a talking with the Fort Norman Metis Land Corporation (FNMLC) and Tulıt'a Dene Band about the project. The research team met with the FNMLC Council and discussed the project in detail with its members. The project was approved,which will allow us to work with this group in the future.The research team also met with the chief of the Tulıt'a Dene Band and the Director of the Tulıt'a Land Corporation, as well as members of several other tribal organizations.

Work was also done with the Tlicho in August and early September. During this time, research in all four Tlicho communities was conducted. The response to the project was good, and the research team was able to collect DNA samples from 105 Tlicho individuals living in the four settlements.

During this same period, the team met with leaders of the North Slave Métis Alliance (NSMA), in Yellowknife, about their possible participation in the project. The NSMA had previously indicated its interest in working with the research team; however, the NSMS was unable to coordinate a meeting during summer 2010.

Since the 2010 visit to the NWT, mitochondrial DNA (mtDNA, female lineages) analysis of all Tlicho individuals has been completed, and the mtDNA results for participants has been uploaded to the project website. Analysis of Y-chromosome (male lineage) variation in the Tlicho population is nearly finished, and data will be uploaded to the project website when complete. In addition, the research team has begun preparing there own test result documents on the mtDNA and NRY results, and will begin sending them to participants in June 2011.

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File Number: 12 410 845
Region(s): DC, SS

Licence Number: 14706
Location: within communities that granted permission in the South Slave and Dehcho regions

The genographic project: anthropological genetic analyses of indigenous human populations of North America - South Slave and Dehcho

During the summer of 2010, discussions were held with several First Nations and Métis organizations from the South Slave and Dehcho regions about conducting project work in their communities. Because discussions with the leadership of these groups had been sporadic during the first half of the year, the research team had hoped to talk directly with them about project research during this visit to the NWT. However, for various reasons, were unable to arrange meetings with the leaders or their respective tribal councils. This was true for one group that had agreed to work with the project in 2009, the Liidlii Kue First Nation, and another group that had tentatively expressed interest in 2010, the Deninu Kue First Nation. Nevertheless, the research team will continue to reach out to them and other Aboriginal communities in the South Slave and Dehcho regions to determine how working together might be possible in the future.

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Licence Number: 14825
Location: Community of Délı̨nę, and within the Délı̨nę District of the Sahtu Region

Mapping, language and stories in Délınę

The Délı̨nę Knowledge Project was pleased to work with the Délı̨nę First Nation in sharing stories from our archives for broadcast on the renewed CBQO community radio program. The research team also worked with the Délı̨nę Renewable Resources Council and students at Aurora College in an exchange of stories related to climate change. A student from Indiana University began interviews related to her doctoral research, entitled "Health, Healing, and the Stories of the Sahtú'otine'". A student from the University of Cologne visited the community, in order to develop her proposal for her doctoral research in linguistics.

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Region(s): IN
Licence Number: 14816
Location: Sachs Harbour

Inuvialuit perspectives of polar bear population health and harvest sustainability
No research was conducted under this licence.

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File Number: 12 410 880
Region(s): IN, GW
Licence Number: 14800
Location: Moose Kerr School (Aklavik), Chief Julius School (Fort McPherson), Sir Alexander MacKenzie School (Inuvik), and Angik School (Paulatuk)

Promoting healthy lifestyles for children in the Beaufort Delta Health and Social Services Authority: a community action
The objectives of this research were to:

1) Strengthen community health and stakeholder partnerships to combat childhood obesity in Inuvialuit and Gwich'in populations through intake of healthy food, exercise, and self-esteem.
2) Establish practive guidelines.
3)Develop a cultually appropriate, peer-assisted school program, adapted from the successful elementary-based healthy living program Health Buddies.
4) Investigate the success of the program with a research study, by adapting the existing research program "Brighter Smiles" for the Inuit culture.

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File Number: 12 410 800
Region(s): IN, GW
Licence Number: 14822
Location: Inuvik

Transience and social cohesion in an arctic community
The proposed project was to examine the impact of transience on the social cohesion of arctic communities. Using Inuvik as a case study, the researchers, in partnership with community groups, will: investigate the extent of mobility in the community; determine what the major negative impacts of this mobility are on community organizations; and discuss what can be done to mitigate these negative impacts. The study will involve a detailed statistical analysis of mobility and interviews with community organizations, followed by a community workshop to validate the findings. It will take place starting in June 2010 and continue until February 2012 when the final community workshop would be held.

The proposed project will be done in several phases. The first phase started in April 2010 and consisted of a detailed analysis of census data relating to mobility for the community of Inuvik and the surrounding area. This research examined census data from 1986 to 2006 and identified the following: the mobility rates of individuals in this region; changes in these rates over the period indicated; the characteristics of migrants; changes in the characteristics of these migrants over the period indicated. After some delays, the data was obtained and is currently being analyzed. A brief introduction to the research was provided at the Inuvik Interagency Committee meeting in May 2010.
The project has currently been put on hold, as the funding from ArcticNet has been canceled. The project was originally delayed, as the research team needed to start with the census data and this took longer to obtain than anticipated. Also there were delays with the ethics review and research licence requirements. There are no results to provide at this time

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Region(s): IN, GW, SA, DC, NS, SS
Location: All NWT communities

Mapping the social economy in northern Canada – Northwest Territories project
This is a multiyear project that began in 2008. The purpose of this project is to develop a comprehensive inventory of social economy organizations in Nunavut, the Northwest Territories, Yukon, Nunavik and Labrador.

A questionnaire was developed and distributed by email and mail in 2008. The response rate was low but thought to be representative of the types of social economy (SE) groups operating in the NWT. This research was published in the April 2009 Northern Review Journal. A copy has been sent to the Aurora Research Institute. Results were also presented at a workshop in Inuvik, in June 2009, and are available on the Social Economy Research Network of Northern Canada (SERNNoCa) website. A second condensed questionnaire was developed in 2009 to get greater input by SE groups. Details of the questionnaire and other aspects of the study are available on the SERNNoCa website at http://dl1.yukoncollege.yk.ca/sernnoca/stories/storyReader$32.

In 2010, work completed in the NWT included updating addresses for SE organizations, mailing out questionnaires, conducting the survey by phone with organizations, and updating the NWT data set of SE organizations. The results of this study will be communicated widely to individuals and communities in the north through SERNNoCa newsletters, summary reports and public information sessions. The list of social economy organizations has been posted on the SERNNoCa website. The point of contact for this research in the NWT is the Institute for Circumpolar Health Research. Survey work is on-going, and the list of social economy groups is being reviewed and updated. The continuation of this research will lead to a better understanding of the numbers, size and types of SE groups that operate in the north. The intent is to show government and others the importance of these kinds of organizations in sustaining northern communities.

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File Number: 12 410 872 **Licence Number:** 14760
Region(s): NS **Location:** Yellowknife

The world of volunteering today: engaging youth, family, boomers, and workplace volunteers
The primary focus of this research is to better understand the volunteering experience and the needs and wishes of Canadian volunteers and potential volunteers. The research team began by exploring what volunteers and potential volunteers were looking for; what their experiences were; and what they believed they could offer. Hearing directly from volunteers themselves, the research team gained a sense of their level of satisfaction, their observations about current opportunities, and their insights about the wants, needs and wishes of the four pre-identified demographic cohorts (youth, families, boomers, and corporate volunteers). The secondary focus was to assess the readiness of organizations to meaningfully involve today's volunteers, and to gain a better understanding of the following dimensions that influence the environment in which they are operating: 1. Global Trends; 2. Canadian Society; 3. Public Policy; 4. Non-Profit and Voluntary Sector; 5. Volunteer Resource Management; and 6. Corporate Community Investment.

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Region(s): IN, GW **Location:** Inuvik, Aklavik, Tuktoyaktuk

Environment, commerce, and Science in western arctic history
Since this research began in September 2010, preliminary assessments of the holdings of Inuvik libraries have been conducted. This work was carried out to help refine the research questions and draft the research proposal. The focus of the research project remains on environment, commerce, and science in western arctic history, but with a better sense of the "characters" that will assist in the study. These include: naturalist Andrew Jackson Stone, naturalist John Murdoch, zoologist Rudolph Anderson, anthropologist Vilhjalmur Stefansson, botanist AE Porsild, biologist Olaus Murie, zoologist Charles Elton, geographer Laurence Irving, and geographer Joseph Sonnenfeld. In addition, and with special interest to the Beaufort-Delta region, the focus will be on the participation by several native northerners in various forms of arctic science between 1882 and 1940. These may include: Natkusiak, Nuligak, and Patsy Klegenberg. Along a similar line, two other individuals have been identified, who came north in the 1920s and aided science and settlement in the interwar period. These are C.T. Pedersen and Knut Lang. The principal researcher plans on spending a portion of the spring of 2011 interviewing local residents in the Delta about Natkusiak, Nuligak, Klegenberg, Pedersen, and Lang.

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Region(s): IN, NS, SS
Licence Number: 14820
Location: Paulatuk, N'Dilo, Dettah, Hay River

Partnering with parents and community members in education

Among aboriginal leaders across Canada, there is a growing recognition of the need to engage parents and community members in supporting the education of their children. The purpose of this research was to: use scientific survey research, not only as a data gathering exercise, but also as a process to form a partnership between the school and the community; and build the capacity that would enable community members to acquire the skills necessary to undertake survey research. This research project begain in Paulatuk and was expanded to include N'Dilo, Dettah and Hay River. High school students and community members in N'Dilo and Dettah were trained to conduct survey research. They carried out a survey in N'Dilo and Dettah that asked every community member to answer questions about their own experiences with education, their feelings about education in general, and their hopes for the education of their children. Results are currently being tabulated. An ongoing feedback process will involve community members presenting the results to everyone in the community and using these results to stimulate a genuine partnership between the school and the community.

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File Number: 12 410 887
Region(s): IN, GW

Licence Number: 14830
Location: Community of Aklavik, and traditional hunting areas of the Inuvialuit and Gwich'in of Aklavik

Aklavik elder's traditional knowledge, climate change and community health

Analysis is still being completed and the research team is still reviewing reports, which confirm what elders and harvesters are experiencing and saying.

The environment is changing and it appears that warming has been occurring at an accelerated rate in the last 15 years; Animals and fish are behaving differently. People are also noticing erosion. As our arctic homeland warms, our traditional harvesters are finding it more difficult to plan trips on the land. With high costs of food and processed foods having to replace traditional food sources, people cannot access the traditional food sources, which raises many health concern issues. However, once the data is analyzed more thoroughly, the research team will have more explanations for what is happening and hopefully there will be solutions to ensure that our people's health and well-being is maintained.

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File Number: 12 410 879
Region(s): IN

Licence Number: 14795
Location: Mackenzie Delta, near Coal Mine Lake

Using Inuvialuit observations to monitor environmental conditions in the Mackenzie Delta Region of the Northwest Territories

A visual method used for documenting Inuvialuit observations of the environmental conditions was field tested. It is called participatory photo-mapping (PPM). The PPM method was tested with pairs of Inuvialuit elders, hunters, and youth on day-trips, at sites across the Mackenzie Delta Region, as well as at a knowledge-exchange camp. Local environmental observations were recorded at 151 sites and grouped into 50 categorical themes. In the fall of 2010, the observations (photos) were entered into a web-based map (mapping.uvic.ca/mackenziedelta).

Findings suggest that a long-term monitoring program built around documenting local concerns and observations using digital photographs and entering them into a web-based map, using the best possible communication and information sharing strategies, will improve our understanding of environmental impacts. By providing a record of the location and a visual representation of environmental conditions, these images will contribute to northern planning and decision-making.

The PPM protocol was found to fit well with Inuvialuit culture and contemporary way of life, and the web-based map was found to be an accessible format to store and preserve local knowledge. This research highlighted the effectiveness of using visual methods to document and communicate Inuvialuit observations, and has great potential to contribute to a long-term monitoring strategy.

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Region(s): SS
Location: Fort Resolution

Human dimension of river resource development and transboundary water security in the Peace-Slave River Basin

My fourth community visit to Fort Resolution, Northwest Territories was on June 6th to 24th, 2010. The purpose of this field visit was to meet members of Deninu Kue First Nation (DKFN) and the Fort Resolution Métis Council (FRMC), to hire a translator/transcriber for the semi-interviews, and to follow-up with the FRMC, DKFN, Deninoo Community Council, and Akaitcho Territory Government regarding the research license with the Aurora Research Institute. The principal researcher returned to Fort Resolution (August 30th to September 19th, 2010) to begin semi-formal interviews. The translator, DKFN, and FRMC recommended twelve individuals to interview. Interviews were audio recorded. There are no preliminary research results, as the fieldwork is not finished. The principal researher is planning two field trips in 2011: late May/early June, and August. The plans for these trips are to conduct follow-up interviews and to review initial interviews with research participants, in order to clarify information and ensure their words are transcribed correctly. Also, the hope is to have the opportunity to go net fishing and go out on the land, which was discussed with a couple research participants.

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Region(s): IN
Location: Aklavik, Ulukhaktok, Paulatuk, Tuktoyaktuk

Climate change impacts on Inuit food security in Canada's western Arctic: constructing a comparative anthropological model to guide adaptation planning

The 2010 research on this project included one field visit to Aklavik and extensive background research in archives in Inuvik and Vancouver. The field visit to Aklavik familiarised the researcher with the community and reinforced the degree of community interest in this study. No interviews or workshops were held, pending final approval of the project from the HTCs.

As a result, no final results have been developed, but an agreement between community HTCs and the research team on when to schedule field visits to each community has been finalised. Field research will commence in April 2011, with visits by the research team to each participating community. Field research will be completed by summer 2011 and data analysis and generation of the results will occupy fall 2011, with results presented to the communities for feedback and generation of a final report in early 2012.

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Location: Inuvik, Aklavik, Tuktoyaktuk, Sachs Harbour, Ulukhaktok, Paulatuk.

BP traditional knowledge collection program.

The objective of the traditional knowledge (TK) program is to collect baseline data, in order to enhance British Petroleum's (BP's) understanding of traditional resources and the marine environment in the project area, and to understand the use of resources by community members. The information will be used to assess the potential and residual impacts of the project on traditional resources and their use, as well as the marine environment. The information will be further used to outline impact mitigation in the environmental and social impact assessment (ESIA). The TK program included, in addition to reviews of secondary data sources, key informant interviews and focus group discussions in each of the six Inuvialuit communities. Interviews and focus groups lasted under two hours. Information was recorded in field notes, audio recordings, and on maps. The research team used key informant interviews and focus group discussion methodologies, which use guides, or semi-structured instruments, rather than questionnaires. The guides are not meant to be strictly adhered to, as it is important to allow people to talk about their knowledge of the project area. Additionally, different guides were used with different informants or focus groups, as each may have had particular areas of expertise or interest. The final guides were agreed upon during discussions with community representatives at a project planning meeting. The interviews were conducted by the lead interviewer and translator from the research team in conjunction with a local research assistant. The principle investigator or one of the traditional studies facilitators was also present during the interviews or focus groups to oversee proper research procedures.

Translation will be provided where requested. Participants were people who were most knowledgeable about traditional resources, resource use, and the marine environment in the project area. Study participants were selected through planning discussions and meetings with community corporations and HTCs.

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Location: Artillery Lake, Alymer Lake, Yamba Lake and Old Fort Rae

Climate change impacts on Canadian Arctic tundra ecosystems – North Slave Métis community traditional knowledge study

As part of a larger IPY project, entitled "Climate change impacts on Canadian Arctic tundra ecosystems" (CiCAT), the North Slave Metis Alliance visited three tundra locations (Artillery Lake, Aylmer Lake and Yamba Lake) and one boreal site, Old Fort Rae, to collect both scientific and traditional observations of the state of the vegetation, terrain, and climate in the North Slave region. Scientists collected samples of insects, vegetation and soils, in order to provide baseline data to government and academic research partners, while elders contributed traditional knowledge on scientific sampling techniques and observations on the changing environment. The two worked together to share information on scientific and traditional knowledge and sampling techniques. Results contribute to the ongoing analysis of this multi-year project and indicate a general warming and drying trend for tundra soils and vegetation, with concurrent changes in plant, insect and other animal behaviours. Bringing together these two forms of knowledge, the goal of the research is to better understand the changes that have occurred and will continue to occur, and make wise choices to prepare.

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Location: Norman Wells

Boreal woodland caribou aboriginal traditional knowledge in the Sahtu Settlement Area

As their name implies, boreal woodland caribou live in old-growth boreal forest environments that stretch across Canada's northern regions. These animals rely on predictable food sources during winter months to survive. Negative impacts to their environment, whether through climate change or human activities, are of great concern to the people of the Sahtu Settlement Area (SSA). The elders and hunters of the SSA have long known that boreal woodland caribou were different from the vast barren-ground herds and are often referred to as the "secret" animals. Boreal woodland caribou habitat supports many other important harvest species, including marten, fox, wolverine and wolf. Disturbances that lead to reduced productivity will seriously impact subsistence trapping practices of the Sahtu Dene and Métis peoples, which could lead to economic instability in many households. There is a general consensus that boreal woodland caribou populations in the SSA are currently healthy; however, many changes are occurring that could impact these populations. Climate change and industry were named as causes for concern. Boreal woodland caribou do not like noise or activity and all attempts should be made to avoid disturbing the animals and their habitat.

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Region(s): DC
Location: Jean Marie River

Impacts to the health and wellness of Jean Marie River in the face of a changing climate

For the Jean Marie River First Nation (JMRFN), changes in weather/climate have always been a part of life that the community has had to adapt to, but the relatively recent changes in climate are, in some cases, unprecedented. Through this project the JMRFN is increasing their awareness of the far ranging impacts that a changing climate can have on different aspects of health. Based on the results of this project, JMRFN has not been as severely impacted by climate change, as many aboriginal communities residing above the tree line in northern Canada. However, from the changes people are observing and experiencing, many of these changes can be directly or indirectly linked with health and climate change. Through this project, our community has taken the first step towards a proactive approach in identifying current and potential impacts associated with climate change, and thinking about how to respond to these impacts. By exploring initial adaptation strategies, our community can prioritize where the community is most vulnerable, determine how severe impacts are (or will be), and determine the ability of the community to adapt in an effort to reduce our vulnerability to climate change.

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Region(s): IN
Licence Number: 14666
Location: Aklavik, Inuvik, Holman, Sachs Harbour, Tuktoyaktuk, and Paulatuk

Polar bear traditional knowledge for the Beaufort Sea

Over the fall and early winter of 2009, the survey instrument for the polar bear traditional knowledge interviews was developed with the assistance of an expert in traditional knowledge work. In early 2010, 30 interviews were conducted in Aklavik, Inuvik and Ulukhaktok. Each interview lasted from one to four hours for a total of 63 hours of interviews. A local assistant and youth were involved in most interviews. The interviews were then professionally transcribed and the interviewer helped fill in any missing gaps that the transcriber could not complete. Maps and diagrams used in the interviews were scanned to create an electronic version, to assist in the next phase of digitizing the information and coding data from the interviews. This was the first year of this multi-year project.

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Region(s): SA
Licence Number: 14815
Location: Délı̨nę

Oral history project contributing to the definition of the extent of the Délınę fishery

The goal of this oral history project is to plot the boundaries of the historic Délı̨nę fishery, in order to define the extent of the Délı̨nę fishery / Franklin's Fort National Historic Site of Canada. This oral history project is interview-based. Potential participants are identified by the Délı̨nę Knowledge Centre as those who can identify the specific location of the fishery generally located on the western end of Great Bear Lake's Keith Arm. Interviews were conducted with the assistance of an interpreter and lasted between 1 to 1 ½ hours. The interviews took place outside, either on land or in a boat, and as close to points of interest as possible. The interviewees were aided by National Topographic maps and printed Google Earth imagery. Interviews were recorded on digital voice recorders for later transcription and archiving, while geographic positional information was collected using a hand-held survey-grade GPS.

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Region(s): IN	**Location:** Paulatuk

Arctic intergenerational perspectives on the future

The aim of this project is to develop and administer an instrument to gather both quantitative and qualitative data linking health and environmental change (caribou population decline) in northern aboriginal communities. The aim is to provide relevant outputs to the communities and partner organizations, including outputs relevant to policy, such as the effects of caribou population change on the health and well-being of northern communities. In addition to identifying current and potential stressors, the work will provide direction on the synergies and the need for integration of environmental management and health and social service planning and policy.

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File Number: 12 410 522	**Licence Number:** 14813
Region(s): SS	**Location:** Łútsę̀lk'é

Arctic intergenerational perspectives on the future

Research was conducted in Łútsę̀lk'é in 2010, to learn more about differences in the resilience of elders, adults, and youth to changes in their local community and environment. Resilience was measured by indicators of self-government, healing and cultural preservation, which had been defined and monitored previously by the community (1998-2001). A community researcher from Łútsę̀lk'é carried out the research under the guidance of the Wildlife, Lands, and Environment Committee of the Łútsę̀lk'é Dene First Nation. More than 125 interviews were completed. In addition to comparing intergenerational differences, the researchers were able to consider patterns of change in the "Dene way of life", including those in caribou harvest and food consumption during a period of relatively significant caribou abundance/access (1998-2000) and during the 2010 period of caribou population decline. For more information on the results of this study, please contact the Łútsël̨k'é Dene First Nation.

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Region(s): IN
Location: Tuktoyaktuk

Socio-economic perspectives on changing caribou populations in Tuktoyaktuk
Tuktoyaktuk hunters' perceptions of changes that impact caribou and the community is one part of a larger research project called Arctic Peoples, Culture, Resilience and Caribou (ACRC). ACRC was an International Polar Year project aimed at learning more about the potential effects and responses to changes in caribou populations in the Canadian north. The project was led by a network of northern Aboriginal organizations, including the Arctic Athabaskan Council, Gwich'in Council International, Dene Nation, Inuit Tapiriit Kanatami and the Inuit Circumpolar Council-Canada. The research was conducted in Tuktoyaktuk. A total of 24 male hunters between the ages of 15 and 74 took part by filling out a questionnaire (28 questions) and participating in a semi-structured interview on three themes: harvest activity, perceptions of change in population movement and health, and rules and governance. In summary, not everyone interviewed thought there was a caribou population decline; of those that did, most attributed declines to natural variability and predation. The effects of resource development, climate change, contaminants and over-hunting were also highlighted as affecting caribou numbers. Most hunters reported being "concerned" about the caribou, either because of uncertainty about what is going on, worries about what information to trust, fears about how to feed their family or general concerns that the decline in caribou numbers would continue. The data and full 2010 report (38 pages) are being held by the Tuktoyaktuk Hunters and Trappers Committee (HTC). For more information, please contact the Tuktoyaktuk HTC.

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File Number: 12 410 847
Licence Number: 14682
Region(s): SA, NS, SS
Location: Former Pine Point mine/townsite, Fort Resolution and Hay River, Giant and Con mine sites, Yellowknife and Dettah, Délı̨nę, Port Radium mine/townsite

Abandoned mines in northern Canada: historical consequences and mitigation of current impacts

In May 2010, 43 oral history interviews about the Pine Point Mine were conducted at Fort Resolution, Katloodeeche First Nation and the town of Hay River. Recordings are currently being transcribed and will be shared with interviewees when they are available. A paper based on archival research about the history of the Pine Point Mine was drafted and submitted to the journal Environment and History, with possible publication by 2011.

Work also continued on the Giant Mine case study. The research team are conducting research on the oversight of environmental assessments as a means to suggest best practices for the Giant Mine Remediation Project's environmental assessment. Research on Giant Mine was conducted at the Prince of Wales Northern Heritage Centre, and preliminary discussions about oral history research on Giant Mine began with the Yellowknives Dene First Nation and the North Slave Métis Alliance, in the spring of 2011.

In Délįnę, two researchers worked with several community members to organize the one month "Learning About the Mines" youth and elders workshop in July and August 2010. Out of this workshop flowed a radio documentary that aired in Slavey on Délįnę Youth Radio. The documentary can be heard at http://Délįnęradio.ca/Abandoned_Mines/Abandoned_Mines.html.

A record of our ongoing activities can be found at the project website, http://niche-canada.org/mining.

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Region(s): SS
Location: Łútsęlk'é

Traditional knowledge study - Łútsęlk'é Dene First Nation

This study reports traditional knowledge gathered from the Łútsęlk'é Dene First Nation community. The study was conducted September 14 to 17, 2010 for continued planning and incorporation into Avalon Rare Metals Inc.'s Developer's Assessment Report, as required by the Mackenzie Valley Environmental Impact Review Board's Environmental Assessment Process.

Qualitative interviews were used as the method of observation for the traditional knowledge study. Elders and individuals with extensive land-use experience and knowledge of the geographic East Arm area of Great Slave Lake were the preferred sample population for the study. The final sample included 13 participants.

Questions included in the qualitative interviews were loosely structured to encourage conversation and designed to gather participants': knowledge about the environment; knowledge about the use and management of the environment; and values about the environment. The interviews explored information specific to Avalon Rare Metals Inc.'s proposed Thor Lake Project site areas and information applicable to the entire geographic East Arm area of Great Slave Lake.

The study results report participants' traditional knowledge of seven specific topics, including terrain (natural events), climate, vegetation, wildlife (hunting and trapping), water (water quality and fishing), significant sites (culturally important sites) and traditional use.

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File Number: 12 410 685 **Licence Number:** 14798
Region(s): NS **Location:** Dettah and N'Dilo

Traditional knowledge study – Yellowknife's Dene First Nation
This study reports traditional knowledge gathered from Yellowknife's Dene First Nation communities in Dettah and N'Dilo. The study was conducted September 20 to 25, 2010 for continued planning and incorporation into Avalon Rare Metals Inc.'s Developer's Assessment Report, as required by the Mackenzie Valley Environmental Impact Review Board's Environmental Assessment Process.

Qualitative interviews were used as the method of observation for the traditional knowledge study. Elders and individuals with extensive land-use experience and knowledge of the geographic North Slave region were the preferred sample population for the study. The final sample included 17 participants.

Questions included in the qualitative interviews were loosely structured to encourage conversation and designed to gather participants': knowledge about the environment; knowledge about the use and management of the environment; and values about the environment. The interviews explored information specific to Avalon Rare Metals Inc.'s proposed Thor Lake Project site areas and information applicable to the entire geographic North Slave region.

The study results report participants' traditional knowledge of seven specific topics, including terrain (natural events), climate, vegetation, wildlife (hunting and trapping), water (water quality and fishing), significant sites (culturally important sites) and traditional use.

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File Number: 12 410 685 **Licence Number:** 14797
Region(s): SS **Location:** Fort Resolution

Traditional knowledge study - community of Fort Resolution
This study reports traditional knowledge gathered from Fort Resolution's Deninu Ku'e First Nation and Metis residents. The study was conducted August 30 - September 4, 2010 for continued planning and

incorporation into Avalon Rare Metals Inc.'s Developer's Assessment Report as required by the Mackenzie Valley Environmental Impact Review Board's Environmental Assessment Process.

Qualitative interviews were used as the method of observation for the traditional knowledge study. Elders and individuals with extensive land-use experience and knowledge of the geographic South Slave region were the preferred sample population for the study. The final sample included 19 participants, including 12 Deninu Ku'e First Nation and 7 Metis individuals.

Questions included in the qualitative interviews were loosely structured to encourage conversation and designed to gather participants': knowledge about the environment; knowledge about the use and management of the environment; values about the environment. The interviews explored information specific to Avalon Rare Metals Inc.'s proposed Thor Lake Project site areas and information applicable to the entire geographic South Slave region.

The study results report participants' traditional knowledge of seven specific topics, including terrain (natural events), climate, vegetation, wildlife (hunting and trapping), water (water quality and fishing), significant sites (culturally important sites) and socioeconomics.

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File Number: 12 410 709
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Region(s): IN, GW
Location: Inuvik, Aklavik, Fort McPherson, Tsiigehtchic

Woodland caribou (boreal population) traditional knowledge in the Gwich'in and Inuvialuit Regions

The Gwich'in Renewable Resources Board (GRRB) and the Gwich'in Social and Cultural Institute (GSCI) collaborated on a study to gather and report on Gwich'in traditional knowledge of boreal woodland caribou. There is a stable population of woodland caribou in the Gwich'in Settlement Area and surrounding regions. However, the Canadian population is classified as threatened under the federal Species at Risk Act. Environment Canada supported the project, in order to integrate traditional knowledge in the recovery planning process for boreal woodland caribou. The GSCI and the GRRB conducted 20 interviews with holders of Gwich'in traditional knowledge, and searched the digital archives of GSCI for relevant primary and secondary data to obtain TK about general observations, special significance, physical description, distribution, habitat, population size and trend, limiting factors and threats, and health of the woodland caribou. Gwich'in hunters have in-depth knowledge about boreal woodland caribou, which they generously shared in the interviews. All recorded interviews were transcribed for use in reporting. Interviewees also recorded geographic information about caribou sightings and hunting areas on maps, which were digitized. Study results and maps are presented in a detailed report. The report was verified in workshops in Aklavik, Inuvik, Fort McPherson, and Tsiigehtchic and provided to Environment Canada. Study results and maps are presented in a detailed report available on-line at: http://www.grrb.nt.ca/traditionalknowledge.htm.

Andrews, Tom
Prince of Wales Northern Heritage Centre

Permit No: 2010-014 **Class:** 2
Region: SA **Location:** Tulít'a District

NWT ice patch monitoring project (2010)
Monitoring ice patches to collect fragile artifacts recently exposed by melting ice.

Bussey, Jean
Points West Heritage Consulting Ltd.

Permit No: 2010-004 **Class:** 2
Region: NS **Location:** Tlicho Settlement Area

Tibbitt to Contwoyto winter road project
Points West Heritage Consulting Ltd. conducted archaeological investigations for the Diavik Diamond Mine (Diavik) on September 15, 2010.

In August, Diavik contacted the researcher to ask if a permit amendment could be requested, to conduct a brief assessment at their mine site on Lac de Gras. Two areas that might contain unrecorded archaeological sites were found by personnel who were selecting locations for proposed wind turbines. These two possible archaeological sites and the four possible wind turbine locations required an archaeological assessment.

Field work was scheduled for mid-September, to coincide with other environmental work. All six locations were visited on the ground. No new archaeological sites were discovered, but one previously recorded site, LcNt-6, was identified.

No new archaeological sites were discovered in the vicinity of the four proposed wind turbine locations, but the possible archaeological site no. 2 (located at wind turbine no. 3) reported by Diavik personnel was actually previously recorded as LcNt-6. Although this site was not mitigated, it is part of the sample of quarry sites that was considered in the original mitigation plan, thus, no further work is required at this site, if wind turbine no. 3 is installed. Possible archaeological site no. 1, also reported by Diavik personnel, is a quartz vein that is naturally eroding; no evidence of human modification was noted. This location is no longer under consideration as a wind turbine site, but if development were to occur in future, no additional archaeological investigation would be required.

Bussey, Jean
Points West Heritage Consulting Ltd.

Permit No: 2010-008 **Class:** 2
Region: NS **Location:** Tlicho Settlement Area

Gahcho Kue project
Points West Heritage Consulting Ltd. conducted archaeological investigations for De Beers Canada Inc. at Kennady Lake (approximately 280 km northeast of Yellowknife), the location of the proposed Gahcho Kué Project. The objectives of the 2010 field investigations included: i) additional inventory and ii)

determination of impact potential and significance of sites. It was determined that six previously recorded sites were within 1 km of the revised project footprint and moderate to high impact potential was predicted. The archaeological significance of these six sites was assessed through a combination of surface examination and subsurface testing. Further work is required at KiNp-4, KiNp-6 and KiNp-41, if avoidance is not feasible. However, investigations conducted to date represent sufficient mitigation at KiNp-5, KiNp-9 and KiNp-14.

Four additional archaeological sites were discovered. Three sites with moderate to high impact potential, located on the west side of Kennady Lake, were assessed. . KiNp-77 is a small site that was mitigated during the assessment process. Further excavation and surface collection is required at KiNp-78, if avoidance is not feasible. As a result of modifications to the Project footprint in September 2010, KiNp-79 is no longer suggestive of moderate impact potential and no further archaeological investigation is required.

The fourth new site was found in the vicinity of a proposed revision to the winter access route for an existing aggregate source. KiNp-80 is situated on a higher landform that would not be suitable as a winter road. KiNp-80 was not assessed because of low impact potential. The only artifact visible on the surface of KiNp-80 was a small white chert biface. This style of artifact and material type is suggestive of the Arctic Small Tool tradition, dating between 2500 and 3500bce. A review of all sites on or near the revised Project footprint is being undertaken to ensure consistent assessment of impact potential and site significance, and will be detailed in the permit report.

Cary, Henry
Parks Canada

Permit No: 2010-002 **Class:** 1
Region: IN **Location:** Inuvialuit Settlement Area

Parry's Rock wintering site National Historic Site of Canada heritage mapping project
Research objectives were to map and document the site, determine if it is being compromised by natural and/or artificial factors, and to learn more about the history of Parry's Rock from European and Aboriginal perspectives.

Cary, Henry
Parks Canada

Permit No: 2010-003 **Class:** 2
Region: SA **Location:** Déljnę District

Parks Canada investigations at Délınę and Cloud Bay, Great Bear Lake, 2010
In September 2009, the Déljnę Land Corporation (DLC) contacted Parks Canada about supporting its 'Grey Goose' interpretive trail project, which included building a boardwalk and interpretive panels at Franklin's fort. In 2010, Parks Canada proposed conducting a topographic survey, to record current conditions and plot the location of archaeological excavations at Fort Franklin by the Prince of Wales Northern Heritage Centre in 1987. In order to do this, a considerable amount of vegetation had to be cleared and the 1987 excavation boundaries located. For the digital survey, geographic coordinates were attained for two temporary survey nails. Chimney collapses, visible wall lines, and a dense series of topographic points were measured from these coordinates. Apart from minor damage caused by

pre-2010 brush clearing, the Fort Franklin site is in remarkably good condition. The fort's south extent does not appear to be affected by erosion or road construction. The main concerns are community plans to expand the cemetery near the Fort Franklin site and the amount of vegetation, which could disturb underlying archaeological deposits. At the request of the DLC, the present extent of the Grey Goose Trail was also mapped. As a result, a low wall was found near the entrance to the Little Grey Goose River.

To reach Could Bay the team landed on the south shore of Dog Point. Detritus of late 20th century occupation was immediately found on the beach, and further inland, was evidence of a late 20th century camp. Between the beach and the 20th century camp is a relict gravel beach, that was selected as a building site for a teaching and healing camp. A thorough foot survey revealed no remnant of human inhabitation.

The team then moved on to map the Grizzly Mountain Portage, and approximately 85 m east from the trail's Cloud Bay entrance, found a line of rounded cobbles and scatter of tin cans. This site probably also dates to the late 20th century. A further 1.4 km section of the portage was mapped by GPS without encountering any other archaeological remains.

Clarke, Grant
Golder Associates Ltd.

Permit No: 2010-012 **Class:** 2
Region: IN **Location:** Inuvialuit Settlement Region

Mould Bay High arctic weather station

In August of 2010, IMG-Golder Corporation conducted a heritage resources impact assessment at the former Mould Bay High Arctic Weather Station on Prince Patrick Island, within the Inuvialuit Settlement Region of the Northwest Territories. Mould Bay High Arctic Weather Station was initially established in the spring/summer of 1948 and closed in 1997, when an automated system was installed. This study was completed on behalf of Public Works and Government Services Canada, Environment Canada and the Architectural and Engineering Company (AECOM), and included the assessment of several sections of land slated for site assessment and the remediation of the abandoned station. No prior archaeological sites have been recorded on Prince Patrick Island; however, two historic graves are known at the site.

This project used standard procedures, which included the following: pre-field studies, on-ground reconnaissance, site documentation and assessment, reporting, and recommendation formulation. Project planning also included provisions for two representatives from Ulukhaktok to accompany the field crew during the field inspection and provide advice regarding the nature and significance of the sites in the area.

Three sites were recorded, as a result of the archaeological investigations at Mould Bay. Site RbPw-1 is a site with two historic burials that relate to the operation of the Weather Station. One of the graves is that of a young Inuit girl named Zipporah. A petition was put in to the Canadian Permanent Committee on Geographical Names in 1977 to have the headland officially designated as Zipporah Point. Sites RbPw 2 (a cache) and RbPw 3 (a stone trap and an inuksualuk) are located well outside of any planned activities and will not be impacted by the proposed remediation. Some of the buildings date to (or very close to) the opening of the site in the late 1940s / early 1950s. As such, preliminary information was collected on the state of the buildings, to assist the Federal Heritage Buildings Review Office in making a determination on whether to classify any of the buildings as Heritage Buildings. One of the buildings, the electromagnetic radiation (EMR) vault, was established in 1961 as a control station for magnetic and seismic observations in the western High Arctic.

Clarke, Grant
Golder Associates Ltd.

Permit No: 2010-020 **Class:** 2
Region: NS **Location:** North Slave Region

Proposed River Lake quarry

In September of 2010, Golder Associates Ltd. conducted a heritage resources impact assessment at a proposed quarry located approximately 20 km northeast of Yellowknife. Work was conducted on behalf of the City of Yellowknife, Department of Public Works and Engineering. The investigations were conducted to identify, record, and evaluate the proposed quarry location, as well as a short seasonal access road, for the presence of previously unrecorded archaeological sites and to provide recommendations to mitigate potential impacts if sites were identified.

Standard procedures were used for this project, including pre-field studies, on-ground reconnaissance, reporting and recommendation formulation. Project planning also included provisions for a representative of the local community to accompany the field crew during the field inspection and to provide advice regarding the nature and significance of the sites in the area.
No previously recorded sites were identified during the pre-field study. Feld investigations focused on areas exhibiting moderate to high potential for archaeological materials that may be impacted by the proposed development. A total of 43 shovel tests were excavated in an effort to identify any buried cultural materials or palaeosols. All tests were negative. A series of relatively old, sawed off tree stumps was observed in the western portion of the study area, but not formally recorded. While the stumps were not fresh cuts, no indication was present that they were of sufficient age to be recorded as an archaeological site. No archaeological sites were recorded as a result of this research.

Dueck, Lori
Parks Canada

Permit No: 2010-007 **Class:** 2
Region: SA **Location:** Tulít'a District

Archaeological survey in the proposed Naats'ihch'oh National Park reserve

From July 6 to 23, 2010, a field crew conducted an archaeological survey in the proposed Nááts'ihch'oh National Park Reserve, located at the headwaters of the South Nahanni River in the Sahtu Dene and Métis Traditional Territory in the Northwest Territories. The research team conducted the survey using three base camps, and recorded a total of 48 archaeological sites, including camps, cut stumps, spruce tree shelters, snare traps, hearths, blazed trees and limbed trees.

The research team set up base camp at the Moose Ponds and recorded 17 sites: three camps, including one older camp used to dry or process meat, axe and saw cut stumps, tree shelters, two snare traps, and a possible vegetation study or soil sampling area, as noted by a linear pattern of wooden stakes embedded in the ground.

The second base camp was set up near the NWT Outfitters Ltd. camp at Divide Lake. Here, 18 sites were recorded, the majority identified as axe and saw cut stumps, and others as spruce tree shelters, blazed and limbed trees, and a hearth.

The third base camp was set up at Grizzly Bear Lake, where 13 sites were recorded, including two camps. One camp consisted of cut tent poles, cache remains, cast iron stove parts, glass and metal fragments, and fuel barrels. The second camp was associated with a large collapsed pole structure, described as a lean-to. Two other sites were recorded along an unnamed stream to the southwest of Grizzly Bear Lake, consisting of saw and axe cut stumps. A third site, with a burnt axe cut log, was recorded at a natural hotspring, located approximately 3.7 kilometres southwest of the base camp. Further analysis is required to understand the human use and occupation of the areas surrounding the Moose Ponds, Divide Lake, and Grizzly Bear Lake.

Harris, Ryan
Parks Canada, Underwater Archaeology Service

Permit No: 2010-001 **Class:** 1
Region: IN **Location:** Inuvialuit Settlement Area

H.M.S. Investigator underwater archaeology survey

After a brief search, the wreck of HMS Investigator, one of the first two ships sent by the Royal Navy in search of the ill-fated Franklin Expedition, whose crew was ultimately credited with identifying the final missing link in the elusive Northwest Passage, was successfully located in close proximity to its reported position of abandonment, in Mercy Bay (Banks Island) in 1853. The wreck was found on July 24, 2010 by Parks Canada's Underwater Archaeology Service (UAS).

Archaeological study of the wreck of HMS Investigator continued for the balance of the two-week project, despite persistent ice cover and strong northerly and southerly winds. Indications are that the wreckage is largely concentrated in one location, with the vast majority of detached timbers observed either immediately alongside or atop of the intact hull. This survey also served to identify the considerable number of ice drags that scar the ocean floor in the general vicinity of the site, with damage from ice representing the most obvious long term threat to the site's integrity. A series of remotely operated vehicle (ROV) dives were completed over the course of two days, covering the entire wreck from stem to stern. Comparison of the ROV imagery, with digital copies of 1848 colour plans of the Investigator, allowed for a preliminary integrity evaluation. The wreck lies in 11 m of water and appears to be substantially intact to the level of the upper deck, with a considerable portion of the lower hull, down to the keel, lying deeply buried in sediment. While the UAS team focused on the preliminary evaluation of the shipwreck, a terrestrial team concentrated on mapping 'McClure's Cache', a depot of ship's supplies that was landed ashore in 1853 and 1854 in Mercy Bay. The land team also visited Mottley Island to relocate the site of reported 'Esquimaux Remains', as listed on an 1853 hydrographic chart of Mercy Bay.

Hartery, Latonia
University of Calgary/Telltale Inc.

Permit No: 2010-018 **Class:** 1
Region: IN **Location:** Inuvialuit Settlement Region

Out of the Northwest Passage cruise.
The purpose of this research was to provide interpretation, and protect the integrity, of sites visited by the Out of the Northwest Passage arctic cruise organized by Adventure Canada.

MacKay, Glen R
Prince of Wales Northern Heritage Centre

Permit No: 2010-006	**Class:** 2
Region: DC	**Location:** Dehcho

Archaeological impact assessment of the Trout Lake airport
The Prince of Wales Northern Heritage Centre (PWNHC) conducted an archaeological impact assessment (AIA) of the Department of Transportation's proposed airport near the community of Trout Lake, NT. The reserve for the Trout Lake Airport and its access road were cleared by chainsaw, in advance of the AIA. Gravel sources for construction of the airport were selected in conjunction with the AIA. A detailed AIA of these areas was not conducted, as they will not be developed as gravel sources. Gravel sources selected for the project include two existing pits, which will be accessed by existing winter haul roads, and one new gravel source, consisting of a northwest-southeast trending ridge, located within the airport reserve.

Pedestrian surveys of the airport reserve and access road indicated that these areas, with the exception of the ridge traversing the east end of the reserve, were situated in low-lying, wet terrain with low potential for archaeological resources. In contrast, the ridge was an elevated, well-drained landform near Trout Lake, and thus had moderate-to-high potential for archaeological resources. All of the ridge lying within the airport reserve will be removed and used as gravel for construction of the airstrip. This area was assessed through pedestrian surveys and the excavation of 78 shovel tests.
Both existing gravel pits had low potential for undisturbed archaeological sites. Gravel extraction from the Sliding Hill source will not require expansion of the pit into undisturbed terrain. While gravel extraction at the Monster Lake source will require enlargement of the pit, gravel will be removed in the direction of a previously cleared winter road. The field survey resulted in the recording of a small historic camp. Located at the eastern foot of the ridge in the airport reserve, this camp consists of several axe-cut stumps and a rusted lard can. This camp was deemed too recent to be recorded as an archaeological site. No archaeological sites will be impacted as a result of the project.

Novecosky, Brad
Golder Associates Ltd.

Permit No: 2010-010	**Class:** 2
Region: NS	**Location:** Akaitcho Region

Łútsę̨lk'émini hydro project
The purpose of this research was to identify any archaeological sites in conflict with the proposed development activities, including a proposed power plant, all season road and transmission line to the community.

Novecosky, Brad
Golder Associates Ltd.

Permit No: 2010-011 **Class:** 2
Region: NS **Location:** Akaitcho Region and the Tlicho Settlement Area

Taltson hydroelectric expansion project
In August 2010, Golder Associates Ltd. conducted an archaeological survey on potential routing options for the proposed Taltson Hydroelectric Expansion Project on behalf of Dezé Energy Corporation. The overall proposed project extends from the Twin Gorges Facility northwest of Fort Smith to the Ekati Mine north of Lac de Gras.

The 2010 investigation included a survey of routing options near the east arm of Great Slave Lake. The reconnaissance was carried out using a combination of pedestrian, boat and low level airplane surveys. Over the course of the two day survey, two previously unrecorded archaeological sites were identified and seven sites that were previously recorded in the 1960s were revisited. The previously unrecorded sites included an early 20th century campsite, with 21 tent rings located on a peninsula in MacLeod Bay and one historic cabin on the east shore of McLeod Bay. The revisited sites include campsites and cabins in the vicinity of the mouth of the Lockhart River, sites associated with Pike's Portage, as well as the remnants of Old Fort Reliance.

Prager, Gabriella
Points West Heritage Consulting Ltd.

Permit No: 2010-005 **Class:** 2
Region: IN **Location:** Mackenzie Delta

Inuvik to Tuktoyaktuk highway
The purpose of this research was to identify and assess any sites found within the proposed development region, so that mitigation measures could be proposed.

Prager, Gabriella
Points West Heritage Consulting Ltd.

Permit No: 2010-009 **Class:** 2
Region: NS **Location:** Akaitcho Region

Bluefish dam project
The Northwest Territories Power Corporation (NTPC) is proposing to replace the old Bluefish dam, which was built in 1944, with a new dam about 400 m downstream on the Yellowknife River. This project is approximately 26 km north of Yellowknife, at the north end of Prosperous Lake. From early historic times, use of the lower section of Yellowknife River, for both travel and fishing, was documented. From August 29 to September 1, 2010, a team from Yellowknife conducted archaeological assessments of the new dam site and associated facilities. Archaeological ground traverses consisted of an almost full circuit of the upper levels of the inundation area, extending from the existing dam site to the lower pool, as well as the present shoreline. The research team also walked the proposed access roads, dam and spillway areas. Subsurface testing was conducted in several locales that exhibited good archaeological potential. A helicopter overflight was done of a possible revised winter road route to the NTPC Bluefish hydro complex. Inspections of ground exposures and subsurface testing were conducted near the western end of that route.

The research team found several hearths, all comparatively recent, along the Bluefish Lake shore and one on the Yellowknife River. Locations of these features were noted and they were photographed, but none appeared old enough to be considered archaeological sites (that is, greater than 50 years). One of these recent camps included a tripod, and a nearby birch tree had a bark strip removed. No older archaeological remains were found. The research team observed considerable past ground disturbance created by large machines, not only near the old dam, but also in several areas along the Yellowknife River. Due to the combination of the previous and ongoing ground disturbing activities around the dam site and hydro facility, since 1944, as well as periodic high water levels, it was concluded that there is a low probability for undisturbed archaeological remains within the currently proposed project area. Therefore, it is unlikely that the development of this dam will conflict with archaeological resources.

Prager, Gabriella
Points West Heritage Consulting Ltd.

Permit No: 2010-016 **Class:** 2
Region: GW **Location:** Gwich'in Settlement Area

Mackenzie highway extension, Gwich'in Settlement Area section

In June, 2010, a team of environmental specialists from Nehtruh-EBA Consulting Ltd. completed an overview assessment of a 175km long corridor of proposed all season highway. This extends from the Dempster Highway, south of Inuvik, through the Gwich'in Settlement Area. The goals of the archaeological overview assessment of the proposed road route, several alternatives, and selected borrow sources were to assess terrain within the project area, in order to rate archaeological potential, and to determine if any previously recorded sites are located in the immediate vicinity of the proposed developments.

The proposed alignment was identified by GPS coordinates and plotted on topographic maps. Terrain potential for archaeological resources was rated by visual assessment, from low and slow helicopter overflights of the route options. Some of the possible gravel sources were also overflown, with the boundaries roughly approximated using topographic features. Coordinates of previously recorded sites were compared to the locations of the alignment and borrow sources. Segments of the road routes and borrow sources were rated as low, moderate or high archaeological potential, and the ratings were recorded on the topographic maps.

Fifteen previously recorded archaeological sites were found to occur in close proximity to the proposed road corridor. These include lithic scatters, cabins and historic trails. The Thunder River and Travaillant River were clearly focal drainage systems for past inhabitants. Furthermore, the vicinities of Travaillant Lake and Woodbridge Lake provided important resources for traditional use. Once the route for the proposed highway is firmly established, intensive ground surveys are likely to find more sites.
The data gathered during this overview assessment study will be used to determine the specific portions of the project that will require detailed reconnaissance during the next phase of study, and to identify where small realignment of routing or relocation of project component boundaries may serve to avoid archaeological sites.

Prager, Gabriella
Points West Heritage Consulting Ltd.

Permit No: 2010-017 **Class:** 2

Region: SA **Location:** Tulít'a District

Mackenzie highway extension, Sahtu Settlement Area, Tulít'a District section

In September 2010, a team of environmental specialists from EBA Consulting Ltd. completed an overview assessment of a 270km long corridor, for a proposed all season highway in the Mackenzie Valley. This is within the Tulıt'a District of the Sahtu Settlement Area, extending north of Norman Wells and south of Tulít'a. The goals of the archaeological overview assessment of the proposed road route were to assess terrain within the project area, in order to rate archaeological potential, and to determine if any previously recorded sites are located in the immediate vicinity of the proposed developments.

The proposed alignment was identified by GPS coordinates and plotted on topographic maps. Terrain potential for archaeological resources was rated by visual assessment from low and slow helicopter overflights of the entire route. Segments of road routes and gravel borrow sources were rated as having low, moderate or high archaeological potential. The ratings were recorded on the topographic maps.

Most of the proposed all season highway route follows the existing winter road alignment within this region. Virtually all of the creek and river crossings already have installed bridges, thus ground disturbance has already occurred at the terrain features that would have the highest archaeological potential. The majority of the tributaries have previously recorded archaeological sites. Approximately 46 of the known archaeological sites are on or in close proximity to the proposed road, including prehistoric lithic scatters, recently abandoned cabins and several graves. Some of these have been mitigated, as part of previous winter road and bridge building projects. At least some of the remainder will likely require consideration during final project design and/or application of mitigation measures. The data gathered during this overview assessment will be used to determine which project components may require ground reconnaissance, and to identify where realignments of project component boundaries may serve to avoid sites. Additional sites are likely to be found during subsequent intensive ground surveys.

Seip, Lisa
Rescan Environmental Services Ltd.

Permit No: 2010-015 **Class:** 2
Region: NS **Location:** Tlicho Settlment Area

Courageous Lake

In 2010, Rescan Environmental Services Ltd. undertook archaeology baseline studies for the Courageous Lake Project. These studies included an assessment of five proposed drill pad location areas, a proposed ice road, and areas of proposed mine site infrastructure. As the exact mine site plan has not be determined yet, the study focused on potential locations of infrastructure, to assist with mine site design.

Community site visits occurred between August 31 and September 3, 2010 and were attended by representatives of several community groups.

The study resulted in the recording of 32 prehistoric sites, 1 historic camp site and 4 rock cairn sites of unknown age. Additionally, seven previously recorded sites in the Project area were revisited, to assess their condition. Additional archaeological studies are planned for 2011. There are no archaeological sites in conflict with the proposed drill pad locations. There are several sites in potential conflict with, or in close proximity to, the proposed winter road and in areas that may be considered for mine site infrastructure. Avoidance is the preferred management recommendation for all sites, and if avoidance is not possible, then systematic data recovery is recommended. As the project is currently in the design phase no impacts are anticipated in 2010.

Webster, Sean
Golder Associates Ltd.

Permit No: 2010-021
Class: 2
Region: IN
Location: Inuvialuit Settlement Area

Supplemental site assessment of the BAR C DEW line station

In August 2010, Golder Associates Ltd., in conjunction with IMG-Golder Corporation, conducted a heritage resources impact assessment at Tununuk Point, located approximately 90 km northwest of Inuvik. Work was conducted on behalf of the Department of Indian and Northern Affairs Canada (INAC), in conjunction with a supplemental Phase III environmental site assessment (ESA), that was conducted in advance of planned remediation activities associated with the former BAR-C site. BAR-C was part of the Distant Early Warning (DEW) system, commonly referred to as the "DEW line", that was abandoned by the federal government in the early 1960s. This study was designed to re-investigate several previously recorded burial sites (NgTu-10 and NgTt-12), to ensure that these sites would remain undisturbed during the Phase III ESA and planned remediation activities. In addition, investigations were conducted to identify, record, and evaluate any previously unrecorded archaeological sites at the DEW line site, and if sites were recorded, to provide recommendations to mitigate potential impacts.

No new archaeological sites were recorded during our investigations. Sites NgTu-10 and NgTt-12 were re-visited and updated information was obtained. Site locations were provided to on-site Golder teams, to ensure avoidance during the ESA program. Although NgTu-10 is located in proximity to areas that will be impacted during remediation, no direct impacts are anticipated to the site and a minimum 50 m buffer will be recommended for avoidance.

A collapsed cabin and an associated trash midden were also recorded during the field studies, and appear to represent the remains of an "Inuit House" typically associated with most DEW line sites.

Wickham, Michelle
Bison Historical Services Ltd.

Permit No: 2010-019
Class: 2
Region: SA
Location: Délı̨nę District

Kwijika M-59 - 2009 post impact assessment

On August 10th, 2010, on behalf of Suncor Energy and at the request of MWH, Bison Historical Services Ltd. carried out a post-impact survey at heritage sites southwest of Great Bear Lake in the NWT. The goals of the investigation were to conduct a post-impact examination of a portion of the access road leading to the airstrip west of the M-59 lease area, and to ensure that no heritage sites were damaged during construction. Fieldwork was based out of Délı̨nę and carried out by helicopter and on foot. Investigations were centered inland, west of the existing M-59 lease.

Post-impact examination of the access road from the M-59 location to the airstrip (Lake 17) successfully achieved the planned objectives. Examination of the access road identified no new heritage concerns, and no existing heritage resources were impacted during development. Several subsurface tests were excavated during this investigation; no previously unidentified heritage resource sites were recorded and no known heritage resource sites occur within 150 m of the project area. The access road from the M-59 lease to the airstrip (Lake 17) is located on an open peat plateau. The focus of this investigation was centered on the access road along the relict beach ridge associated with Lake 17 (the airstrip), where all subsurface tests yielded negative results. An extensive pedestrian survey was conducted along this ridge on both sides of the access road. Cultural material was not observed on the surface of the ridge.

Post-impact archaeological field investigations of the small portion of the access road leading to the airstrip, west of the M-59 lease area, identified no new heritage resource sites. As such, there are no further heritage concerns regarding the Suncor Energy M-59 access road.

Wickham, Michelle
Bison Historical Services Ltd.

Permit No: 2010-022
Class: 2
Region: DC
Location: Dehcho Region

Quarry operation - Fort Liard area

In October of 2010, on behalf of Jayhawk Frontier Exploration Ltd., Bison Historical Services Ltd. carried out a survey at heritage sites near Fort Liard. Investigations were aimed at satisfying two objectives: a pre-impact examination of areas that may be impacted by the 2010/2011 mineral extraction operation development, and a re-visit to all known sites within 150 metres of the proposed development, to ensure they will be avoided by current development activities.

Fieldwork was based out of Fort Liard and carried out by helicopter and on foot. Investigations were focused within Jayhawk Frontier Exp. Ltd. claim "E" (K13733), located in the narrow valley west of Fisherman Lake, between Pointed Mountain and 'B' Mountain. This claim will be developed during the winter of 2010/2011. An attempt was made to revisit a single known site (JcRx-4); the available location coordinates places JcRx-4 in an area that is currently under water (due to beaver activity and active springs). The research team were therefore unable to determine if JcRx-4 will be impacted by the proposed development. Subsurface tests in areas adjacent to the purported location of JcRx-4, however, did not identify any cultural materials.

The Jayhawk Frontier Exp. Ltd. claim "E" (K13733) was repeatedly overflown at low elevation and slow speed, to facilitate the identification of any possible heritage concerns. The area was also examined on foot and high potential areas, such as flat benches adjacent to the stream, the upper bench along the south edge of "B" Mountain, and dry flat areas along the south side of the Amoco access road were repeatedly shovel tested (20 shovel tests). No previously unidentified heritage sites were found during these investigations.

Youell, Alan
FMA Heritage Resources Consultants Inc.

Permit No: 2010-013
Class: 2

Region: SA **Location:** K'asho Got'ine District, Colville Lake

Colville Lake airport project

On behalf of the Department of Transport, Government of the Northwest Territories, FMA Heritage Inc. conducted an archaeological investigation in 2010 for proposed airport development, rerouted winter road and gravel borrow source locations, situated approximately 2.5 kilometres southwest of the community of Colville Lake. Field reconnaissance consisted of a pedestrian traverse and intensive surface examination to determine the presence of unrecorded archaeological or cultural sites. Shovel tests were excavated adjacent to any newly recorded archaeological, sites in order to determine the site's boundaries.

The proposed airport and rerouted winter road were assessed as having low potential for the identification of archaeological or cultural sites. Surface inspection of the airport and rerouted winter road footprints did not identify any archaeological, historic or traditional land use sites.

The two potential borrow sources, situated west of the proposed airport location, have a higher potential for the identification of archaeological or cultural sites. Surface inspection of the borrow source footprints did result in the identification of an archaeological site. This site, located north of the existing winter road and on the same landform as one of the potential borrow sources, consists of a lithic scatter concentrated within a 2 X 0.5 metre area. The surface was hand exposed and a representative sample of lithic debitage was collected. Seven shovel tests were excavated within the site area, in order to determine if the site had a subsurface component and to establish site boundaries. A buffer zone around the site was flagged off and the client has agreed with an avoidance recommendation, thereby mitigating any impact to the archaeological site. Based on results of this assessment there are no outstanding conflicts between archaeological, historical and traditional land use sites and the development areas.

Ash, Jason
De Beers Canada Inc.
300, 5102-50th Ave
Yellowknife, NT X1A 3S8

Permit No: S-10/11-3053-YK

Fish Species Studied: Benthic Invertebrates; Phytoplankton; Zooplankton; Lake Chub; Slimy Sculpin; Burbot, Longnose Suckers; Lake Trout; Arctic Grayling; Round Whitefish

Region: NS

Snap Lake and Northeast Lake water licence requirement studies

De Beers Canada Inc. is planning to undertake a number of aquatic programs, to satisfy the requirements of the water licence and fisheries authorization for the Snap Lake Mine. The planned programs include:

1) an open water zooplankton program (Snap Lake).
2) an open water phytoplankton program (Northeast Lake).
3) a fall benthos program (Snap and Northeast Lakes).
4) a small bodied fish monitoring program at the embankments and reference areas (Snap Lake).

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Permit No: S-10/11-3017-YK-A1

Fish Species Studied: Lake Trout; Northern Pike; Cisco; Inconnu; Burbot; Sculpins Spp; Invertebrates; Zooplankton; Lake Whitefish; Broad Whitefish

Region: IN

Fisheries assessment of Big Lake (Illkaasuat) using the SPIN protocal

The objectives of this program are to:

1) gather baseline life history information on species present in Big Lake.
2) estimate density and abundance of lake trout in Big Lake.
3) collect other biological and environmental data in Big Lake.

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Permit No: S-10/11-3034-YK

Fish Species Studied: Dolly Varden; Arctic Grayling; Whitefish spp; Benthos

Region: IN

Integrated freshwater and dolly varden monitoring program for Ivvavik National Park
The main project objectives are:

1) to document and assess the dolly varden fish habitat.
2) to provide juvenile dolly varden relative density estimates.

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Permit No: S-10/11-3002-YK-A1

Fish Species Studied: Nine-spined Stickleback; Pond Smelt; Cisco; Lake Chub; Spoonhead Sculpin; Emerald Shiners; Spot-tailed Shiners; Macroinvertebrates

Region: IN, GW

Effect of permafrost thawing on contaminant bioavailability to fish in the Mackenzie Delta
The objectives of this program are:

1) to determine the effects of permafrost thaw slump on freshwater ecosystems.
2) to determine if higher contaminant loads will be found in fish and macroinvertebrates of permafrost thaw-slump lakes compared to those without thaw slumps.

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Permit No: S-10/11-3016-YK
Region: NS

Fish Species Studied: Slimy Sculpin

Diavik Diamond Mines Inc. aquatic effects monitoring program - small-bodied fish health
The objective of this program is to conduct health assessments (both lethal and non-lethal) on slimy sculpin in Lac de Gras, as part of the annual aquatic environmental effects monitoring program at Diavik Daimond Mines. These data will be used to assess potential environmental effects related to Diavik Mine.

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Permit No: S-10/11-3032-YK-A2

Fish Species Studied: Incubating Lake Trout eggs; Sculpins; Invertebrates

Region: SS

Nonacho Lake trout study program

The objectives of this study are to:

1) quantify egg deposition by depth on available habitat for fourteen known or suspected representative shallow reefs in Nonacho Lake.
2) quantify egg deposition by depth on available habitat for ten representative deep water reefs in Nonacho Lake.
3) collect tissue samples from lake trout in Nonacho Lake for mercury testing.

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Permit No: S-10/11-3015-YK-A1

Fish Species Studied: Burbot; Northern Pike; Lake Trout; Lake Whitefish; Cisco; Longnose Sucker; White Sucker; Ninespine Stickleback; Trout Perch; Lake Chub, Slimy Sculpin; Spoonhead Sculpin; Deepwater Sculpin; Spottail Shiner; Inconnu; Walleye

Region: NS, SS, DC

Ecology of a boreal fish, the burbot: implication for northern development

The objectives of this research are:

1) to define the role burbot play in boreal lake ecosystems, through an assessment of trophic position and food web dynamics of burbot relative to sympatric boreal fish species, and to make comparisons among lakes, among apex predators, and between climatic regions.
2) to examine the reproductive ecology of burbot, determine the drivers of reproductive effort (ontogenic or condition) among lakes, and compare between climatic regions.

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Permit No: S-10/11-3024-YK

Fish Species Studied: Lake Whitefish; Cisco; Lake Trout; Northern Pike; Burbot; Brook Stickleback; Ninespine stickleback; Lake Chub; Pearl Dace; Northern Redbelly Dace; Longnose Sucker; White Sucker; Trout -perch; Slimy Sculpin; Spoonhead Sculpin; Yellow Perch; Walleye; Aquatic Invertebrates; Plankton

Region: NS, SS, DC

Enhanced investigations of the factors affecting long-term contaminant trends in predatory fish in Great Slave Lake, NT

The objective of this research is to conduct food web studies in Great Slave Lake, to determine if contaminant inputs to the lake have been changing and to learn more about contaminants in the Great Slave Lake food web.

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Permit No: S-10/11-3025-YK
Region: NS, SS, DC, SA
Fish Species Studied: Lake Trout; Cisco; Burbot; Northern Pike

Spatial and long-term trends in persistent organic contaminants and metals in fish from the NWT
The objective of this study is to continue to investigate whether contaminant levels are changing in fish in the Northwest Territories, with a focus on Great Slave Lake, which the investigators have been studying since the early 1990s. Lake trout will be collected from Great Slave Lake (Hay River and Łútsę̀lk'é area), and Great Bear Lake (Délı̨nę area). The investigators also plan to collect burbot from the Łútsę̀lk'é and Fort Resolution areas of Great Slave Lake, northern pike from the Fort Resolution area of Great Slave Lake, and cisco from the Deline area of Great Bear Lake.

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Permit No: S-10/11-3026-YK
Fish Species Studied: Benthos; Plankton; Larval Marine Fish; Zooplankton; Marine Fish (Pelagic);
Region: IN

ArcticNet 2010 expedition: Integrated Regional Impact Study (IRIS) of the coastal Western Canadian Arctic
The Arctic Ocean and its peripheral seas have experienced unprecedented change, over the past 15 to 20 years, associated with climate variability and change. In particular, sea ice is now observed to form later, break-up earlier, and at its minimum, to cover a progressively smaller area of the Arctic Ocean. Our understanding of the impacts of these changes on the physical, biological and geochemical processes in the Canadian Arctic Ocean is progressing, but still wanting. Since 2004, ArcticNet researchers have been conducting extensive multidisciplinary sampling programs in the Beaufort Sea/Mackenzie Shelf/Amundsen Gulf region. The goal of the ArcticNet marine-based research program is to study, on a long-term basis, how climate induced changes are impacting the marine ecosystem, contaminant transport, biogeochemical fluxes, and exchange processes across the ocean-sea ice-atmosphere interface in the Canadian Arctic Ocean. Ultimately, the knowledge generated from this multi-year program will be integrated into regional impact assessments to help decision makers develop effective adaptation strategies for the changing coastal Canadian Arctic.

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Permit No: S-10/11-3019-YK

Fish Species Studied: Inconnu; Lake Whitefish; Burbot; Northern Pike; Lake Trout; Walleye; Sucker; Cisco;

Region: NS

Cycle 2 Giant Mine environmental effects monitoring

The objective of this research is to conduct stratified random sampling using gillnets, to determine presence/absence of inconnu in Area 1, east of Great Slave Lake. The study is a replicate of the study undertaken in 2009, using two 100 yard, 30 feet deep gillnets, and two 100 yard, 12 feet deep gillnets. The distribution of the fish within the nets will also be considered.

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Permit No: S-10/11-3027-YK-A1

Fish Species Studied: Arctic Charr; Arctic Cisco; Least Cisco; Cisco spp.; Lake Trout; Lake Whitefish; Pink Salmon; Sockeye Salmon; Chum Salmon; Whitefish Ninespine Stickleback; Cod; Sculpin;

Region: IN

Baseline fish study and charr community-based monitoring plan for Sachs Harbour

The objective of this research is to conduct baseline studies for freshwater fish and anadromous fish in the areas surrounding Sachs Harbour and Ulukhaktok, to provide local HTCs and DFO fisheries managers with information on baseline conditions for fish and changes to fish growth in the region.

Arctic charr will be sampled from the Sachs Harbour and Ulukhaktok areas for analysis. Arctic charr otolith, tissue samples, and stomach contents will also be sampled for follow-up analysis. This data will provide information towards:

1) length, weight, and age frequencies for the thesis project analysis.
2) responses of charr to variability in the context of climate change.
3) establishing baseline conditions, current charr biodiversity, and to provide a point of reference, against which future changes can be compared.
4) providing data and knowledge towards the creation and implementation of community-based monitoring plans.
5) future (follow-up) assessments of genetic and morphological variation, genetic population structure, and variation in the dynamics of charr populations within the Sachs Harbour area.
6) the development / provision of information towards long-term community-based monitoring plans for charrin the area.

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Permit No: S-10/11-3037-YK

Fish Species Studied: Lake Trout; Walleye; Northern Pike; Inconnu; Whitefish;

Region: SA

Investigation of mercury levels in piscivorous fish from ten lakes in the Sahtu Settlement Area NWT
The Sahtu Renewable Resource Board will undertake an independent study of methyl mercury levels in top predatory fish from a number of lakes in the Sahtu Settlement Area. These bodies of water include retesting Lac St. Therese and Kelly Lake, as well as lakes identified by the Tulita and Norman Wells Renewable Resource Councils. They include Doctor, Lennie, Mahoney, Turton, Man Drowned Himself, Stewart, Hodgson, and Sam McRae Lakes. Tissue, soil, and water analyses are the primary study components.

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Permit No: S-10/11-3005-YK-A1

Fish Species Studied: Ringed Seals; Bearded Seals;

Region: IN

Assessment of ringed seals and bearded seals
The objectives of this research include the following:

- In community-based programs, to sample and measure ringed seals taken in the annual harvest in the Ulukhaktok (n = 100) area, using reproductive status and body condition as indicators of ecosystem productivity and fluctuations in the seal population.
- To examine the aspects in the context of regional ice conditions.
- To co-ordinate with, and provide for, "stock health" related studies, such as disease and contaminants.
- In community-based programs, to sample and measure bearded seals that happen to be taken in the annual harvest in the Ulukhaktok (n = 5) area, to examine reproductive rates, growth, condition, and prey preferences.

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Permit No: S-10/11-3014-YK-A1

Fish Species Studied: Ringed Seals

Region: IN

Movements and behaviour of ringed seals tagged near the seal monitoring site, 2010
The objectives of this research are to:

1) examine philopatry in adult and subadult seals within the Ulukhaktok harvesting area.
2) examine any opportunistic overlap in space and time of tagged seals that may travel in the vicinity of the offshore Beaufort lease areas and/or near operating seismic vessels, during migrations in Canadian or Alaskan waters.
3) examine the potential return (timing and routes) of tagged animals in the year following tagging (e.g., do animals that travel to Russia return? If yes, what is route do they take?).
4) work with community harvesters in the development of live-capture skills and methods, and deployment of satellite-linked transmitters.

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Permit No: S-10/11-3018-YK-A1 **Fish Species Studied:** Bowhead Whales
Region: IN

Bowhead whale tagging - Beaufort Sea 2010
The information gained through this study is essential for the assessment of potential impacts of offshore development on bowhead whales in the South East Beaufort Sea, as well as for the mitigation of these impacts. Bowhead whales of the Western Arctic population come to the Beaufort Sea from approximately mid-August to late-September, in order to feed. At this time, they form large loose aggregations in the offshore Beaufort. The aggregations form in traditional areas, where oceanographic conditions favour the concentration of zooplankton, which is their main prey item. Not all aggregation areas are attractive to bowheads in all years, due to varying oceanographic conditions.

Some of these feeding aggregation areas are located in offshore waters, which have been subject to seismic exploration activity in the 1980's, as well as from 2006 to 2008. Extensive seismic projects are also planned for 2009 and 2010. In addition, on their return fall migration to the Bering Sea, this same stock is also subject to extensive shipping and seismic activities in the Alaskan Beaufort and Chukchi seas. Bowheads feed in these aggregations in the Canadian Beaufort Sea for 6-8 weeks, where they replace stores expended during migration.

Disturbance of whales from underwater noise emanating from ships, barges, aircraft, seismic operations, scientific operations, or other sources of noise associated with human-induced industrial underwater noise (e.g., the Mackenzie Gas Project, as well as all the same sources and activities in Alaska) can elicit avoidance responses in the whales.

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Permit No: S-10/11-3040-YK-A1

Fish Species Studied: Lake Trout; Northern Pike; Longnose Sucker; Burbot; Lake Whitefish; Round Whitefish; Slimy Sculpin; Ninespine Stickleback; Spottail Shiner; Benthic Invertebrates;

Region: NS

2010 Discovery Mine aquatic monitoring

INAC is conducting an aquatic health monitoring program in 2010. This includes collection of fish tissues (muscle and liver), benthic invertebrates, and sediment samples for metals analysis. This program is designed to monitor the health of the environment after closure and remediation of the Discovery Mine.

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Permit No: S-10/11-3028-YK

Fish Species Studied: Lake Trout; Cisco; Arctic Grayling; Round Whitefish; Northern Pike; Lake Whitefish; Burbot; Longnose Sucker;

Region: SA

Cisco diversity in Great Bear Lake NT

The objectives of this project are to:

1) examine morphological, meristic and life history characteristics of archived ciscos collected from Great Bear Lake over the past 7 years, to test the hypothesis that there are multiple forms/species including shortjaw.
2) conduct targeted sampling and examination of characteristics for cisco from deeper regions of Great Bear Lake (>50 m) to increase sample size and increase the range of surveyed habitat.
3) compare Great Bear Lake cisco with shortjaw cisco identified in other lakes to verify species identification, and provide information that will feed into broader questions regarding the taxonomy of shortjaw cisco.

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Permit No: S-10/11-3029-YKA1

Fish Species Studied: Lake Trout; Cisco; Arctic Grayling; Round Whitefish; Northern Pike; Lake Whitefish; Burbot; Longnose Sucker;

Region: SA

Monitoring of lake trout stocks in Great Bear Lake (Sahtu)

The objectives of this project are:

1) to determine the extent of movements (if any) by lake trout in Great Bear Lake, by using molecular genetics to monitor size and age structure, fecundity (egg number per female), growth and mortality of lake trout populationns from Dareli (Keith), Turili (McVicar), Kwit tla (McTavish), Tugacho (Dease) and Tirato (Smith) Arms of Sahtu (Great Bear Lake). These data will be used for stock assessment purposes and to follow changes in the biological characteristics of lake trout stocks over time.
2) to monitor species composition and, if sufficient data are available, presence, size, structure and other biological characteristics of by catch and invertebrate species.

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Permit No: S-10/11-3035-YK
Fish Species Studied: Arctic Grayling; Dolly Varden;
Region: GW

Tagging of dolly varden and biological investigation of arctic grayling from the Rat River

The objectives of this project are:

1) to continue the annual monitoring of the population status of dolly varden from the Rat River by recording catch-effort data for dolly varden caught in the local monitor's nets and comparing results to earlier years to examine for trends in CPUE, length, age, weight, sex ratios, proportion of spawners, and growth rate.
2) to apply Floy tags to 500 dolly varden that are seined from the Rat River for recapture in 2011, in order to estimate population size.
3) to determine whether some sea-run dolly varden do not migrate to sea annually.
4) to collect samples of arctic grayling to obtain biological information such as length, weight, age, sex and maturity, and diet, as well to collect tissue samples.
5) to better understand interactions of arctic grayling and dolly varden.

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Permit No: S-10/11-3036-YK-A2
Fish Species Studied: Arctic Char; Burbot; Lake Trout; Lake Whitefish; Broad Whitefish: Starry Flounder; Arctic Flounder;
Region: IN

CHARR monitoring at Hornaday River NT 2010

The objectives of the project are to:

1) maintain the charr monitoring project and continue to provide information on the status and life history of the charrstock.

2) continue to provide important support information for the formulation, delivery and compliance of the Paulatuk Charr management plan.

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Permit No: S-10/11-3039-YK-A1 **Fish Species Studied:** Arctic Grayling; Dolly Varden
Region: IN

Tagging of dolly varden and biological investigation of arctic grayling from the Big Fish River
The objectives are:

- to apply up to 500 Floy tags to dolly varden that are seined from the Big Fish River, for recapture in 2011, to estimate population size.
- to collect samples of arctic grayling, to obtain biological information, such as length, weight, age, sex and maturity, diet, and tissue samples.
- to generate a population estimate of dolly varden from the Babbage River by Floy tagging 500 fish at Canoe Creek Fish Hole for recapture in fall 2011.
- to evaluate the relative contribution of dolly varden from the Babbage River, Big Fish River and Rat River to the fishery at Shingle Point and other fishing locations along the North Slope in 2011.

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Permit No: S-10/11-3043-YK **Fish Species Studied:** Arctic Char; Lake Trout;
Region: IN

Assessment of arctic Charrstock of Fish Lake, through harvest-based monitoring of subsistence catches and arctic charrgenetics sampling
This licence is for two studies, which include the following:

1) An assessment of the arctic charr stock of Fish Lake, through harvest-based monitoring of subsistence catches.
2) Arctic charr genetics sampling.

The harvest-based assessment program involves enumerating and measuring arctic charr taken in the annual harvest at Fish Lake each October. Indicators of stock status, such as CPUE, age, length, weight, sex and maturity, are used to evaluate the impact of the fishery on the stock, and to provide information on status and life history of the charr stock. This project has been done annually since 1992, and is one of the longest charr monitoring studies in place in the ISR. It has provided important support for formulation, delivery and compliance of the Uluhkaktok Charr Fishing Plan.

The objective of the genetics study is to conduct analyses using tissue samples of arctic charr collected from known upstream spawning/rearing areas within each of the following rivers: Kuujjua, Kuuk, Kagloryuak, Kagluk and the Naloagyok, and from the coastal fisheries near the community of Ulukhaktok to: a) determine if Arctic charr in each of the above described river systems are genetically distinct, and b) determine the relative contributions of charr from each of these river systems to harvests in the coastal fishing areas.

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Permit No: S-10/11-3008-YK

Fish Species Studied: Arctic Grayling; Burbot; Slimy Sculpin; Lake Trout; Lake Chub; Longnose Sucker; Round Whitefish;

Region: NS

EKATI Diamond Mine - fish monitoring program 2010

Rescan Environmental Services Ltd. (Rescan) was retained by BHP Billiton Canada Inc., the operator of the EKATI Diamond Mine, to monitor fish populations on the EKATI claim block during the open-water season, including a post-2008 Panda Diversion Channel (PDC) Monitoring Program and the Nero-Nema monitoring program . The main objectives of the studies are:

1) to monitor the use of the stream habitat in the Panda Diversion Channel by spawning fish, particularly arctic grayling.
2) to compare the biological characteristics of fish populations in the PDC with those in nearby referece streams.
3) to monitor the use of the stream habitat in Nero-Nema Stream by spawning fish, particularly arctic grayling.
4) to evaluate the effectiveness of Nero-Nema streambed enhancement sites by assessing the presence of eggs withing the modified locations.

These projects are continuations of long-term monitoring programs at EKATI. The PDC, for example, has been monitored every year since 1998, although the specific sampling objectives have varied among years.

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Permit No: S-10/11-3044-YK

Fish Species Studied: Inconnu; Lake Whitefish; Burbot; Lake Chub; Lake Trout; Cisco; Slimy Sculpin; Round Whitefish; Northern Pike; Ninespine Stickleback; Arctic Grayling; Emerald Shiner; White Sucker; Longnose Sucker; Spottail Shiner; Trout-perch;

Region: NS

Behchoko and the Yellowknives Dene inconnu studies on Great Slave Lake

The objectives of this project are:

1) to develop a framework for delivering community monitoring education and to gather community knowledge regarding the design of a fish monitoring program for the North Arm of Great Slave Lake and Marion Lake, with a particular focus on shortjaw cisco and inconnu.
2) to implement a pilot study to evaluate various monitoring designs for the North Arm of Great Slave Lake and Marion Lake.
3) to sample at the mouth of the Yellowknife River during fall, to assess the presence/absence of mature, spawning-condition, in-migrating adult inconnu.
4) to sample potential age-0 and age-1+ juvenile rearing habitat in the Yellowknife River and Prosperous Lake to assess the presence/absence of juveniles that may have been spawned in the Yellowknife River or Prosperous Lake.

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Permit No: S-10/11-3050-YK

Fish Species Studied: Yellow Walleye; Burbot; Northern Pike; Longnose Sucker; White Sucker; Lake Whitefish;

Region: DC

Tathlina Lake walleye stock Aassessment

The objective of this work is to assess the status of the Tathlina Lake walleye stock, using experimental multi-mesh gillnet gangs, and sampling the catch for fork length, round weight and sex/maturity. This study is part of the multi-year research plan for the management of the commercial fishery.

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Permit No: S-10/11-3033-YK

Fish Species Studied: All Fish and Benthos species (excluding Dolly Varden);

Region: IN

Northern coastal marine studies, arctic coastal ecosystem studies (ACES)

The objectives of this work are:

1) to address DFO's responsibility to ensure that relevant science is conducted, in order to provide scientifically defensible advice, in support of regulatory decisions regarding the protection of fish and fish habitat.
2) to better understand the significance of the Tarium Niryutait Marine Proected Area (TNMPA), with regards to the health and conservation of beluga whale populations, and other marine species, in the Canadian Beaufort Sea.

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Permit No: S-10/11-3020-YK

Fish Species Studied: Inconnu; Lake Whitefish; Burbot; Northern Pike; Lake Trout; Walleye; Sucker; Cisco;

Region: NS

Cycle 2 Giant Mine environmental effects monitoring

The objective of this research is to conduct stratified random sampling using gillnets, to determine presence/absence of inconnu in Area 1, East of Great Slave Lake. The study is a replicate of the study undertaken in 2009, using two 100 yard, 30 feet deep gillnets, and two 100 yard, 12 feet deep gillnets. The distribution of the fish within the nets will also be considered.

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Permit No: S-10/11-3038-YK

Fish Species Studied: Braod Whitefish; Lake Whitefish: Arctic Cisco; Least Cisco; Nortern Pike; Laket Trout; Inconnu; Longnose Sucker; Arctic Grayling;

Region: GW

Travaillant Lake post fire pilot project

The objectives of the project are:

1) to evaluate the effects of fires in the Travaillant Lake area on plant species composition, growth and regeneration. Special emphasis is being placed on the regeneration of lichens.
2) to assess the fisheries resource in Travaillant Lake and compare this data to previous GRRB work, address community concerns about low oxygen levels, and gather more baseline information.

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Permit No: S-10/11-3011-YK-A2

Fish Species Studied: Arctic Grayling; Burbot; Lake Trout; Northern Pike; Round Whitefish; Lake Chub; Ninespine Stickleback; Slimy Sculpin;

Region: NS

Gahcho Kue' project

De Beers Canada has been conducting fish and fish habitat baseline studies for a number of years, in the area of the Gahcho Kue project. The overall objective of this year's program is to collect additional fish and fish habitat baseline information on small lakes and streams potentially affected by the Gahcho Kue project.

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Permit No: S-10/11-3031-YK

Fish Species Studied: Arctic Grayling; Burbot; Lake Trout; Northern Pike; Round Whitefish; Lake Chub; Ninespine Stickleback; Slimy Sculpin;

Region: NS

Gahcho Kue' Project

De Beers Canada Inc. has been conducting fish and fish habitat baseline studies for a number of years, in the area of the Gahcho Kue project. As a component of the 2010 program, the hydroacoustic survey objective is to generate reliable estimates of the large-bodied fish populations of Kennady Lake.

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Permit No: S-10/11-3001-YK-A2

Fish Species Studied: Lake Chub; Slimy Sculpin; Burbot; Longnose Suckers; Lake Trout; Arctic Grayling; Round Whitefish;

Region: NS

Small bodied fish survey

This research includes:

1) an open water plankton program at Snap and Northeast Lakes.
2) a winter and fall benthos program at Snap and Northeast Lakes.
3) a small-bodied fish monitoring program at the embankments and reference areas at Snap Lake. The primary objective of this monitoring program is to determine whether target fish species (lake chub and slimy sculpin) are present at the newly constructed embankments, during periods while life history requirements (e.g., spawning, nursery, foraging, and rearing activities) occur.

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Permit No: S-10/11-3000-YK-A1

Fish Species Studied: Walleye; Arctic Grayling; Burbot; Lake Chub; Emerald Shiner; Shiner;

Region: NS

Baker Creek fish use and habitat study
The objectives of this reasearch are to:

1) provide evidence of successful spawning by Arctic Grayling and quantify numbers.
2) observe and describe habitat use.
3) determine fish use and assess habitat in Reaches 1,2, 3, 5 and 6.
4) examine fish health and make comparisons between fish in the upper and lower portions of Baker Creek.

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Permit No: S-10/11-3023-YK

Fish Species Studied: Lake Chub; Slimy Sculpin; Burbot; Arctic Grayling; Longnose Sucker; Lake Trout; Lake Whitefish; White Sucker; Spottail Shiner; Northern Pike; Emerald Shiner; Ninespine Stickleback;

Region: NS

Tundra mine remediation project: fish spawning survey - egg sampling
The objectives of this work are:

1) to monitor the potential impacts from discharge of treated effluent on arctic grayling and longnose sucker spawning, rearing, and feeding activity in downstream habitats.
2) to provide evidence of spawning activity by arctic grayling and/or longnose suckers in the watercourses downstream of the effluent discharge (connecting Powder Meg, Sandy, and Whale lakes).
3) to observe and determine habitat use (spawning, feeding, and rearing) by adult and young-of-the-year fish, while in the watercourses between Powder Meg and White Tail lakes.

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Permit No: S-10/11-3030-YK

Fish Species Studied: Lake Trout; Lake Whitefish: Round Whitefish; Cisco; Arctic Grayling; Northern Pike; Longnose Sucker; Burbot; Slimy Sculpin; Lake Chub;

Region: NS

Fisheries survey and baseline construction monitoring program for Tundra Mine

The objectives of the 2010 construction baseline monitoring program are to measure potential effects on fish from:

1) the release of arsenic-treated effluent into the drainage system.
2) the historical contamination from the mine to confirm the results of the human health and ecological risk assessment (HHERA).
3) to monitor potential effects associated with treatment and discharge of arenic-impacted tailings on fish spawning and feeding.

Potential effects to fish from effluent and historical contamination will be achieved through sampling both predatory and forage fish for measures of health assessments (internal and external) and fish tissue analyses. Potential effects associated with treatment and discharge of arsenic-impacted tailings will be achieved through larval fish surveys and feeding studies. Potential effects to fish spawning and feeding from treatment and discharge of arsenic-impacted tailings will be achieved through larval fish surveys, which will also identify critical habitat.

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Permit No: S-10/11-4001-IN

Fish Species Studied: Chinook Salmon; Chum Salmon; Coho Salmon; Pink Salmon; Sockey Salmon;

Region: IN, GW, SA, DC

Baseline data collection of pacific salmon distribution in the Western Arctic

The objective of this research is to collect information on the distribution of Pacific salmon in the Western Arctic. Once we establish a basic understanding of the distribution for each species, we can monitor annual catches to track dispersal. A major shift in these distributions could serve as an indicator of environmental change.

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Permit No: S-10/11-3022-YK

Fish Species Studied: Bull Trout; Arctic Grayling; Slimy Sculpin;

Region: DC

Habitat use of bull trout in Prairie Creek and the lower South Nahanni River Watershed

The objectives of this project are to improve the understanding of habitat associations for bull trout found in Prairie Creek and lower South Nahanni river system. Specific objectives are to:

1) document spawning and winter habitat use.
2) document baseline habitat reference conditions, which can be used to monitor change over time.

3) document seasonal movements by bull trout populations in the lower South Nahnni River Watershed.

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Permit No: S-10/11-4000-IN
Fish Species Studied: All Species, excluding marine mammals;
Region: IN

Inuvik to Tuktoyaktuk Highway 2010 summer field program

EBA proposes to undertake freshwater fish community and fish habitat characterization of selected lakes and streams potentially impacted by the proposed highway from Inuvik (end of Navy road) to Granular Source 177 (kilometer 118). The study will examine the fish species presence or absence at stream crossings along the alignment of the proposed highway. Potential effects of road construction on fish and fish habitat will be assessed and will be used in the development of effective avoidance or mitigation measures.

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Permit No: S-10/11-3012-YKA1
Fish Species Studied: Lake Trout; Burbot; cisco; Deepwater Sculpin; Slimy Sculpin; Lake Whitefish; Round Whitefish; Ninespine Stickleback; Benthic Invertebrates; Phytoplankton; Zooplankton; Opossum Shrimp;
Region: NS, SS, DC

Lake trout diversity and the deepwater food web

The objectives of this project are to:

1) sample lake trout from each of the 3 depth strata (0-50m, 50-100m, and >100m) at 10 sites in the East Arm, Great Slave Lake.
2) sample the lower food web (i.e. mysis, zooplankton, benthic invertebrates) at two previously sampled sites in the East Arm, Great Slave Lake.
3) collect habitat data (i.e., depth, temperature, oxygen) from each site sampled.
4) collect biological data and tissue samples from 25 lake trout and other species captured per site.

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Permit No: S-10/11-3007-YK **Fish Species Studied:** Northern Pike; Lake Whitefish; Ninespine Stickleback; Cisco; Burbot; Trout Perch; Sculpin;

Region: NS

2010 fisheries baseline studies for Avalon Rare Metals Inc. Thor Lake rare earth metals project

The objectives of the fisheries field program are to:

1) determine fish presence and distribution.
2) establish relative abundance of fishes in fish bearing waterbodies.
3) characterize habitats of fish bearing waterbodies.
4) measure trace element concentrations in fish tissues.
5) characterize the aquatic invertebrate community structure (phytoplankton, zooplankton, and macroinvertebrates).
6) establish baseline water and sediment quality.

Patershuk, Matt
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Permit No: S-10/11-3055-YK-A1 **Fish Species Studied:** Flathead Chub; Burbot; Northern Pike; Finescale Dace; Longnose Dace;

Region: DC

Fish salvage / rescue for culvert to be replaced by clearspan bridge

The objective of the project is to upgrade a current highway crossing structure from a culvert to a clear-span bridge, increasing fish habitat values, and returning native hydro-dynamics to the channel. A culvert located approximately 41.1 kms north of the Alberta/NWT border, spans Swede Creek and requires replacement. The culvert is to be removed and upgraded to a clear-span bridge. During the culvert removal, the work site will be isolated and dewatered, and flows will be diverted around the work area. Once the channel has been restored and stabilized, flows will be returned. A fish rescue/salvage will need to be completed within the isolated area. Ruskin Construction will be completing the work, and EDI Environmental Dynamics Inc will complete the fish salvage and serve as the environmental monitor onsite. Initially the project was to be completed in the fall, but, due to extreme flood conditions, it was not a reality. Instituting fish passage, via a diversion channel, while construction is under way, should limit any impact to fish in the area. Sampling will consist of short-term handling just to remove fish from the isolated site. No high-stress activities (surgery, long-term containment, prolonged handling) are proposed. Electro-fishing in cold-water conditions may have a an impact on fish, so it will only be used as a contingency sampling measure. Seine netting, dip netting, and minnow trapping will be the preferential methods of fish capture.

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Permit No: S-10/11-3010-YK **Fish Species Studied:** Sediments; Phytoplankton; Zooplankton;
Region: NS

Arsenic in Yellowknife lakes at peak productivity

The objective of this research is to determine the total arsenic concentration and arsenic species in water, porewater, sediments, and plankton from arsenic-contaminated lakes in Yellowknife.

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Permit No: S-10/11-3021-YK **Fish Species Studied:** Dolly Varden;
Region: IN, GW

Stock discrimination of dolly varden from river systems of the NorthSlope, Yukon and NWT
The collection of sagittal otoliths (for micro-chemical analyses), genetic samples and biological data from local fishermen's subsistence harvest of dolly varden will be used to identify genetic and otolith trace element and isotope markers, for the purpose of stock discrimination, in the mixed stock fishery along the Beaufort Sea Coast. Using otolith micro-chemical techniques and otolith isotopes we will likely be able to identify river of origin in fish captured in the mixed stock fishery. Tissue samples will also be collected, to identify genetic differences between the various dolly varden stocks.

Shapiro, Michael
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Permit No: S-10/11-3003-YK **Fish Species Studied:** Ninespine Stickleback; Brook Stickleback;
Region: NS, SS, DC

Molecular analysis of evolutionary change in stickleback populations
Two species of sticklebacks (ninespine and brook) will be collected to establish genetic crosses between these species, to identify the genes that control interesting skeletal traits.

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Permit No: S-10/11-3006-YK-A1 **Fish Species Studied:** Lake Trout; Grayling; Northern; Longnose Sucker; Burbot; Stickleback; Slimy Sculpin; Lake Whitefish; Round Whitefish; Cisco; Arctic Grayling;
Region: NS

Baseline fisheries surveys for the Couragous Lake project
The objective of this project is to characterize the streams and lakes in the Corageous Lakes project (Seabridge Gold Inc.) area, so that the effects assessment can be carried out, and appropriate monitoring programs and fish habitat compensation plans can be developed. The focus of this baseline

study will be to gain an understanding of the structure and growth patterns of the fish community inhabiting the lakes and streams, as well as the fish habitat prior to development of the site.

Stein, Terry
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Permit No: S-10/11-3045-YK

Fish Species Studied: Arctic Grayling; Lake Trout; Burbot; Whitefish; Northern Pike; Walleye; Inconnu; White Sucker; Longnose Sucker; Emerald shiner; Spottail Shiner; Ninespine Stickleback; Brook Stickleback; Lake Chub; Trout-perch; Sculpins; Aquatic Invertebrates; Unspecified Species;

Region: IN, GW, SA

Determination of fish presence for legal investigation
The objective of this project is to determine the presence of fish for a legal investigation.

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Permit No: S-10/11-3013-YK
Region: IN

Fish Species Studied: Beluga Whale;

Assessment of contaminants, disease and health effects in beluga whales through harvest-based monitoring at Hendrickson Island NT
The objective of this project is t to evaluate the risk of adverse health effects associated with exposure to several persistent organic pollutants and mercury in beluga whales in the Western Canadian Arctic. To do this, a comprehensive sampling program will be carried out, which includes the measurement of contaminant levels and endpoints associated with possible health effects of contaminant exposure.

Tonn, William
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Permit No: S-10/11-3009-YK

Fish Species Studied: Aquatic Invertebrates; Round Whitefish; Lake Trout; Lake Chub; Burbot; Longnose Sucker; Arctic Grayling; Slimy Sculpin; Ninespine Stickleback;

Region: IN, GW, SA, SS, NS, DC

Improving habitat connectivity to enhance productive capacity of arctic freshwater ecosystems
The objectives of this project are to evaluate the effectiveness of the habitat manipulations at improving spawning/rearing habitat and assess the biotic and abiotic responses of these ecosystems to these

treatments. In 2010, monitoring of baseline, pre-treatment conditions of the habitat and biota in both the lakes and lake outlets will be continued.

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Permit No: S-10/11-3041-YK

Fish Species Studied: Lake Trout; Arctic Grayling; Broad Whitefish; Round Whitefish; Lake Whitefish; Inconnu; Arctic Cisco; Least Cisco; Northern Pike; Longnose Sucker; Burbot; Pond Smelt; Slimy Sculpin; Ninespine Stickleback;

Region: IN

Hydro-ecological responses of arctic tundra lakes to climate change and landscape perturbation The objective of the overall research program is to improve knowledge of present-day food webs/productivity in small arctic tundra pond/lake systems, in order to better predict the effects of a warming climate on food-web structure, function, and productivity. The specific objectives of this research are to:

1) better understand the impact of permafrost thaw on shoreline slumping, an analogue for a warming climate, on the bottom components of the aquatic food web in small arctic tundra lakes.
2) characterise the food web (including fish) in 27 Mackenzie Upland lakes and determine the relative importance of top down vs. bottom up controls on the zooplankton communities.
3) characterise the trophic structure within the food web of each lake using stable isotope signatures.
4) elucidate the determining factors on why some lakes do host fish, while others do not.

Bartzen, Blake
Canadian Wildlife Service
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Permit No: 5157
Region: SA

Species: Passerines; waterfowl and cliff-nesting raptors;
Location: Mackenzie Mountains, west of Tulıt'a and Norman Wells

Protected areas strategy - Shúhtagot'iné néné

This research was valuable in determining the distribution and abundance of birds that nest in the Shúhtagot'iné Néné candidate protected area. A total of 2,633 birds, representing 78 species, were detected on avian point-counts (83 point count plots, 249 point counts), aerial waterfowl and cliff surveys, and incidental observations. A total of 490 waterfowl, representing 18 species, were observed, including lesser scaup, northern pintail, American widgeon and tundra swan. Species detected within the study area and outside of their breeding range include red-throated loon, harlequin duck, barrow's goldeneye, and long-tailed duck. Several rare shorebird species were observed, including wandering tattler and Baird's sandpiper. A total of seven raptor observations were made, representing four species, including golden eagle, northern hawk owl, rough-legged hawk, and bald eagle. Rock and willow ptarmigan were observed 44 times. A total of 1,975 passerine observations, representing 39 passerine species, were recorded, of which the five most common were white-crowned sparrow, American tree sparrow, American robin, Wilson's warbler, and savannah sparrow. One passerine species at risk (olive-sided flycatcher) and several species outside of their published ranges (palm warbler, golden-crowned sparrow) were observed. Two rusty blackbirds (special concern) were detected. Incidental observations were made of 29 moose, 666 mountain caribou, 97 Dall's sheep and 6 grizzly bears. This research concludes field work for the Phase II Ecological Assessment of the area. Due to the high richness of bird species and the unique bird community assemblage documented with our research, Shúhtagot'iné Néné is of high conservation value.

Bartzen, Blake
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Permit No: 7415
Region: IN

Species: Sea ducks
Location: McKinley Bay

Identification of Beaufort Sea migration corridor for sea ducks

This was the second year of a capture and tagging effort for long-tailed ducks at McKinley Bay; 25 ducks (23 females and 2 males) were tagged there in August 2009 (Permit WL007401). By mid-to late September 2009, the ducks began to migrate along the coast of northern Canada, Alaska, the Queen Charlotte Islands of British Columbia, and the Kamchatka Peninsula of Russia. The birds moved northward along the Russian and Alaskan coasts during spring migration, and five of the six transmitters that made it through spring migration indicated that those birds likely bred in the Northwest Territories, relatively close to McKinley Bay. The sixth transmitter that made it through spring migration indicated that the bird moved along the Russian coast in spring, and may have nested in northern Russia. Another bird migrated westward along the northern coast of Russia, but the transmitter ceased functioning before spring migration was complete. By early September 2010, all of the 2009 transmitters ceased to consistently provide locations.

The long-tailed ducks captured in 2010 followed a similar migration pattern as the 2009 ducks, and are currently wintering off the coasts of Russia and southern Alaska. It is anticipated that these transmitters will function through the 2011 breeding season, and the last data should be recieved from these transmitters in early autumn 2011.

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Permit No: 5752
Region: DC

Species: Forest birds
Location: Dehcho territory (near Fort Liard, Fort Simpson and Kakisa), northeast British Columbia, and northwest Alberta

Quantifying boreal bird and mammal responses to human land use practices in the Northwest Territories

In 2010, the focus was on bird response to line recovery in lowland habitats and approximately 350 point counts were conducted. Point counts were balanced between lines and forest interiors, and among line recovery categories. Vegetation data were collected at all point count locations. No mammal work was conducted in 2010.

The preliminary results from the spot mapping work in 2008 and 2009 show that ovenbirds have a behaviorally driven response to line regeneration. Male ovenbirds strongly avoid bare lines and appear to use them as territorial boundaries. As the amount of vegetation on the lines increases, they still avoid lines and use them as boundaries, especially when local population density is higher. Because of this interaction between behaviour and habitat structure, even 40-year-old lines may have an effect on local ovenbird density.

Initial results of our point count data from 2008 and 2009 show that bird community metrics for songbirds in upland habitats show little long term response to lines. A few species initially respond positively or negatively, but, with a few exceptions, this response disappears as vegetation height on lines increases.

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Permit No: 5758
Region: NS, SS, IN, GW, DC, SA

Species: Voles; mice; lemmings; shrews;
Location: Norman Wells, Tulít'a, Yellowknife, Bliss Lake, Gordon Lake, Daring Lake, Fort Liard, Fort Simpson, Fort Smith, Fort Resolution, and Inuvik

Northwest Territories small mammal and hare survey

In summer 2010, small mammal numbers were average at most sites in the NWT, except in Fort Resolution, where a record peak occurred. Peaks in hare numbers occurred in the NWT every 10 years or so, in 1962, 1971, 1980, 1990, and then in 1999-2000. Hare populations across the NWT remained low between 2002-2006, but increased rapidly in 2009 and may have peaked in 2010. This latest peak in numbers is not as high as in previous decades. Lower peaks were also observed in the Yukon.

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Permit No: 5753 **Species:** Peregrin falcon
Region: SA, IN **Location:** Mackenzie Valley between Norman Wells and Inuvik

Peregrine falcon survey along the Mackenzie River Delta
Occupancy was average (55%). The surveyed portions of the Mackenzie Valley appeared to have reached a maximum occupancy for peregrine falcon territorial pairs in the early 1990s. New sites can be the result of a known single territory being split between two pairs. New sites were also found outside the study area.

Cluff, Dean
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Permit No: 5681 **Species:** Muskox
Region: SS **Location:** near Łútsęlk’é

Muskox abundance and distribution survey
During the survey, there was reasonable (30%) coverage of the treeline via initial random selection of line placement. There was also good weather and visibility for the observers conducting the survey. A total of 358 muskoxen were observed within the treeline. The muskoxen were very clumped in distribution and were found at a low density. Few calves were seen. The Border A licence area was not covered, as there was not enough time to complete a survey there this year.

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Permit No: 5684 **Species:** All wildlife
Region: NS **Location:** near the Nico project lease area, within a 5 km radius of the proposed access road

Baseline wildlife studies for the Fortune Minerals NICO Project aerial wildlife surveys
Caribou, moose and wolves were observed. Numerous sets of caribou tracks were also observed and recorded. During the raptor surveys, one new nest was discovered, near Lou Lake. To date, 15 nests

occupied by bald eagle, great grey owl, peregrine falcon and raven have been identified. During the ground surveys, two frog egg masses were collected, frozen, and archived in Yellowknife for possible future selenium concentration analysis.

Craig-Moore, Lea
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Permit No: 4807	**Species:** Whooping crane
Region: SS	**Location:** Within a 200 km radius centered on 60°10′ N, 133°20′ W.

Whooping crane ecology and rehabilitation

The 2010 whooping crane nesting season was a great success; water levels in spring and late summer were excellent and chicks benefited from mild summer conditions. A record number of nests were found in May. The second highest number of pre-fledged chicks and sets of twins was recorded in August. For the first time since 1988, chicks were captured and banded in Wood Buffalo National Park.

During the surveys, 74 whooping crane nests were discovered. This is the highest number of nests on record and is likely attributable to a pulse of new birds, hatched three to five years ago, entering the breeding population. An additional ten territorial pairs were also found in the breeding marshes, indicating a healthy breeding population and a significant potential expansion in coming years. A total of six nests were also found outside the park boundaries.

Due to reductions in the regional whooping crane budget, clutch size was not determined. In August, CWS located family groups suitable for capture. It was decided that families with twins were not eligible for capture, because it would be too great a disturbance to the family group to split up both young and parents.

Nineteen attempts were required to capture nine chicks on August 2 and 3. Blood, feather and cloacal swab samples were taken from all chicks, but no feces were collected, as the birds did not defecate. The average weight of the 9 chicks was 4800g and the platform transmitter terminal (PTT) and color leg bands averaged 2.075% of the chicks' body weight, well within the limits outlined by the bird banding lab.

Whooping crane fledging success surveys were carried out by CWS from August 9 to August 11. A total of 46 young were discovered in 36 family groups (i.e. 5 sets of twins). This is the second highest chick production and the second highest number of August twins on record.

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Permit No: 5683	**Species:** Bathurst and bluenose caribou
Region: NS	**Location:** near Wekwèti and Brown Lake

Bathurst caribou health, condition and contaminants monitoring

Two separate sampling collections were conducted during the Tłı̨chǫ and Yellowknife Dene First Nation limited community hunts. Health, body condition, and disease and parasite status of barren-ground caribou provide important information on the status of the herds and on the potential for population growth.

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Permit No: 5682
Region: NS

Species: Bathurst and bluenose caribou
Location: west of Gamètì, in the Gamètì and Wekwètì area, and east of Gordon Lake

Monitoring of the Bathurst and Bluenose East herds

For the Bathurst caribou herd, 3,533 caribou were classified in late winter, and the calf-to-cow ratio was 45 per 100. For the Bluenose East caribou herd, 6,597 caribou were classified in late winter, and the calf-to-cow ratio was 47 per 100.

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Permit No: 7412
Region: IN

Species: Caribou; muskox;
Location: Banks Island and northwest Victoria Island

Arctic Island caribou and muskox population survey

The Banks Island survey was flown in 126.6 hrs between July 17 and July 26, 2010. There were 215 adult caribou and 70 calves seen on transect, giving a population estimate of 1,097 ± 343 (95% confidence interval) non-calf caribou on Banks Island. There were a total of 7,185 adult muskoxen and 869 calves observed on transect, yielding a population estimate of 36,676 ± 4,031 (95% confidence interval) non-calf muskox on Banks Island. Observations of calves may be biased low. One grizzly bear, three foxes, 28 adult wolves and six wolf pups were observed during the survey.

The northwest Victoria Island survey was flown in 78.1 hrs between July 28 and August 15, 2010. There were 30 adult caribou and four calves seen on transect in blocks A and B, yielding a population estimate of 150 ± 104 (95% confidence interval) non-calf caribou in this area. Caribou observed in block C were considered to be of the Dolphin-Union herd based on the locations of collared caribou. There were 85 adult and 14 calf caribou seen on transect in block C, giving a population estimate of 430 ± 214 (95% confidence interval) non-calf caribou. There were a total of 2,273 adult muskoxen (and 31 calves) seen on transect, yielding a population estimate of 11,442 ± 1,637 (95% confidence interval) non-calf muskoxen. One polar bear, 18 adult wolves and one wolf pup were also observed during the Victoria Island survey.

Davison, Tracy
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Permit No: 7416 **Species:** Dall's sheep
Region: GW, IN **Location:** Richardson Mountains

Dall's sheep aerial survey in the Richardson Mountains

Survey blocks were successfully flown this year in June and July, though there were some setbacks due to weather. The survey began in good weather on June 22 and the first two days of flying went well. On June 24, an incoming system of low cloud and sporadic rain showers forced the crew to abandon the survey of Bell block when it was only half completed. Weather conditions were poor thereafter, only permitting survey flights on July 5 and 6 with survey completion on July 9. The entirety of Bell block was reflown July 9, replacing the sheep observations made during the interrupted survey of that block on June 24.

In total, 700 sheep were observed. Of this number, 549 were adult sheep, 150 were lambs and one sheep was unclassified. Of the adult sheep, 384 were nursery and 165 were rams.

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Permit No: 7377 **Species:** All wildlife
Region: IN **Location:** Arctic Islands

Ecosystem classification of the Northwest Territories arctic islands (2010-2012)

A Cessna 337 aircraft, retro-fitted with a sliding camera window, was used to take several thousand high resolution oblique landscape photos, over an 11-day period in July, 2010. The area covered included all of Banks Island and the NWT portion of Victoria Island. Since the aircraft required good airstrips to operate from, no ground sampling (ground-truthing) was possible last summer.

Preliminary mapping of the ecological units of the southern NWT arctic islands was undertaken during a workshop in early December, 2010.

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Permit No: 7376 **Species:** Polar bears
Region: IN **Location:** Tuktoyaktuk and the Tuktoyaktuk Peninsula

Populations and sources of recruitment in polar bears

Ten GPS collars were deployed on adult female polar bears. Their movements are monitored by satellite. Ongoing analyses for utilization, distribution and habitat selection will be completed in 2011.

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Permit No: 5622
Region: NS, SS, IN, GW, DC, SA
Species: All wildlife
Location: All NWT

Wildlife health, condition, and genetic monitoring

Although most wild animals are healthy, diseases and parasites can occassionally occur in any wildlife population. Some diseases and parasites are naturally occurring and appear to cause few problems in their host species, while others have the potential to impact wildlife at both the individual animal and population level.

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1 Federal Drive, Room 501
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Permit No: 4811
Species: Mallards; northern pintails; American green-winged teal; and American wigeons;
Region: DC
Location: Mills Lake near Fort Providence

Western Canadian cooperative pre-season waterfowl banding program - Mills Lake Station, NWT

Banding was conducted in the marsh on the east end of Mills Lake. A total of 1,905 ducks were banded (405 mallards, 1,484 northern pintails, one American green-winged teal and 15 American wigeons) over the study period (August 11 – 26). For mallard and northern pintail, the percentage of young totaled 21% and 78%, respectively. Seven previously banded ducks were captured, consisting of three mallard and four northern pintail. Detailed information may be obtained from the Mills Lake 2010 Pre-Season Banding Report from the South Slave Environment and Natural Resources GNWT office.

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Permit No: 7411
Region: IN
Species: Yellow warbler
Location: Inuvik

Latitudinal impacts on carry-over effects in a neotropical songbird (*Dendroica petechia*)

Stable isotope data from feather samples are currently being analyzed. Data for both 2009 and 2010 will be analyzed together for carry-over effects. Stable isotope signatures from 2009 suggest that the wintering location and wintering habitat for Inuvik birds differ from those of yellow warblers in Revelstoke, BC.

The mean density of breeding birds in the study site was 4.05 pairs/hectare. The average number of nestlings hatched per clutch was four and individual nest success was 67.5% (n=71 nests), while pair success (whether a pair produced one successful clutch within the season) was 81% (n=53 known-fate pairs).

Groves, Debbie
US Fish & Wildlife Service
3000 Vintage Blvd., Suite 240
Juneau, AK, USA 99801

Permit No: 7413
Region: IN
Species: Waterfowl
Location: Tuktoyaktuk Peninsula and the southern two-thirds of Banks Island

Aerial waterfowl surveys on Banks Island and Tuktoyaktuk Peninsula, 2010
Data analysis is ongoing. A final summary report, including population estimates and distribution maps by species, will be produced in 2011 and distributed to interested parties. The raw data (georeferenced bird and mammal observations) will also be available to the Government of the Northwest Territories upon request.

Hegel, Troy
Yukon Government
PO Box 2703
Whitehorse, YT Y1A 2C6

Permit No: 5759
Region: DC
Species: Caribou
Location: South Nahanni River watershed adjacent to the Nahanni National Park Reserve, between Flat River and Hyland.

Population monitoring of the South Nahanni and Coal River caribou herds
During the South Nahanni survey, 385 animals were classified, resulting in a calf-to-cow ratio of 26.1 calves to 100 cows, and a sex ratio of 26 bulls to 100 cows.

During the Coal River survey, 207 animals were classified, resulting in a calf-to-cow ratio of 40 calves to 100 cows, and a sex ratio of 32.5 bulls to 100 cows. Calf recruitment in both herds was greater than in either 2008 or 2009. This may be due to more favorable weather conditions during calving in the spring of 2010. This increase in recruitment follows a pattern observed in other mountain caribou herds across the Yukon this year.

Hood, Alexandra
Snap Lake Mine - De Beers
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Yellowknife, NT X1A 3S8

Permit No: 5687
Region: NS
Species: All wildlife
Location: near Snap Lake Mine

De Beers Snap Lake Mine: 2010 wildlife effects monitoring program

Results of the 2010 wildlife effects monitoring program will be presented in the 2011 annual wildlife effects monitoring report. Although there continue to be interactions with wildlife on site, there have been no caribou, wolf, grizzly bear, black bear or wolverine mortalities at the Snap Lake Mine.

Kardynal, Kevin
Canadian Wildlife Service
Box 2310
5019 52nd Street, 4th Floor
Yellowknife, NT X1A 2P7

Permit No: 4808
Region: DC
Species: All wildlife
Location: Ka'a'gee Tu candidate protected area, near Kakisa

Ecological assessment of the Ka'a'gee Tu canadidate protected area

In 2010, 38 sites (114 point count stations) were surveyed within the Ka'a'gee Tu boundary, with a total of 1,131 birds, representing 79 species, detected. The five most abundant species were: chipping sparrow, Swainson's thrush, palm warbler, Tennessee warbler and yellow-rumped warbler. Several species at risk were also detected in the study area, including olive-sided flycatcher (five), rusty blackbird (14) and Canada warbler (four). The nearest known population of Canada warblers is approximately 150 km from the birds detected in the Cameron Hills in the southern portion of the study area, which represents a significant range extension for this species and an important discovery in understanding the ecological values of the area. The avifauna of Ka'a'gee Tu has not been surveyed previously, so this study adds greatly to the understanding of the bird community composition in the area.

Kelly, Allicia
GNWT Department of Environment and Natural Resources
PO Box 900
Fort Smith, NT X0E 0P0

Permit No: 5618
Region: SS
Species: Beverly Barren-ground Caribou
Location: near Łútsël k'é, Fort Resolution and Fort Smith

Population parameters, movements, distribution and habitat use of the Ahiak and Beverly Barren-ground caribou herds

Calving ground delineation surveys have demonstrated a drastic decline in the Beverly herd since 1994. Surveys of the Ahiak calving ground indicates a decline in the number of calving cows from 2006 to 2008. Monitoring the Beverly and Ahiak caribou herds is important to determine their status.

Klaczek, Mike
Canadian Wildlife Service
PO Box 2310
5019 52nd Street
Yellowknife, NT X1A 2P7

Permit No: 5029
Species: Trumpeter swan

Region: DC **Location:** southeast Dehcho region

2010 international trumpeter swan aeiral survey

A total 249 swans (182 adults/subadults and 67 cygnets) were observed within the surveyed areas and 60 (48 adults/subadults and 12 cygnets) were observed outside the survey areas (incidentals). Areas covered by both the 2005 and 2010 surveys were similar in both the distribution and number of swans observed, although the mean brood size was slightly higher in 2010 (2.91) compared to 2005 (2.37). Results from all areas surveyed within the rocky mountain population range (Northwest Territories, Yukon, British Columbia, and Alberta) are being summarized and further analysis is being conducted, to determine a population and productivity estimate. Final results for the rocky mountain populations of birds are expected to be available by spring 2011. The report will be available online at: http://library.fws.gov/birdpublications.html.

Klimstra, Jon
US Fish & Wildlife Service
11510 American Holly Drive
Laurel, MD 20708

Permit No: 5692 **Species:** Mallards; American green-winged teal; American widgeon; blue-winged teal; northern pintail; northern shoveler; American black duck;
Region: NS **Location:** Stagg River delta near Behchokò

Western Canada cooperative waterfowl banding program - Stagg River station

A total of 12 B-2 traps were used over the course of the trapping period. This resulted in 137 trap nights and a total of 749 birds being captured. The total number of birds comprised 656 mallards, 64 American green-winged teal, 11 American widgeon, 4 blue-winged teal, 1 northern pintail, 1 northern shoveler, and 1 American black duck. The majority of the birds captured and banded were recently hatched birds, possibly indicating a good production year. There was a large case of trap mortality on the last day, which was thought to be caused by mink.

Langlois, Karla
EBA Engineering Consultants
Box 2344
#201, 4916 49th Street
Yellowknife, NT X1A 2P7

Permit No: 5694 **Species:** All wildlife
Region: NS **Location:** Nechalacho Rare Earth Element project site, Thor Lake

2010 baseline environmental studies, Nechalacho Rare Earth Element project site

A total of 39 breeding bird stations were surveyed in eight different habitat types. A total of 199 breeding birds were recorded and an additional 138 birds were recorded as incidentals, either outside the survey station or outside the survey time. A total of 23 bird species were detected, and an additional seven species were detected as incidentals. Of the species recorded during the breeding bird survey, the yellow-rumped warbler was the most common breeding bird detected, followed by Swainson's thrush, chipping sparrow, and American robin. Using the Shannon-Wiener Index, the habitat types with the highest species diversity were the black spruce-tamarack-water sedge fen and the black sprucecloudberry-sphagnum moss bog forest. Bedrock-lichen-juniper-saxifrage and lichen-bearberry woodland habitats exhibited the lowest species diversity. During the June and July waterfowl surveys, a total of 319 waterfowl were observed, with an additional 495 documented as incidentals. Scaup species were the most common within the study area.

A total of 280 mammal observations from 12 species were recorded within the local study area. Moose were the most common species recorded, followed by snowshoe hare, black bear, and red squirrel.

Ten broad habitat types within the local study area were assessed for their ability to support chosen indicator species for specific life requisites and seasons. Moderate to high barren-ground caribou habitat is included in bedrock-lichen, shrub-wet, sedge-fen, and open water habitat types. Moderate to high moose habitat includes broadleaf upland, shrub fen, sedge fen, and open water habitat types. Moderate to high olive-sided flycatcher habitat includes bedrock-lichen, shrub wet, and shrub fen habitat types. Moderate to high rusty blackbird habitat includes treed fen, shrub fen, and sedge fen habitat types; whereas moderate to high common nighthawk habitat includes bedrock lichen, treed fen, shrub wet, sedge fen, and open water types.

Latour, Paul
Canadian Wildlife Service
5019 52nd Street
Yellowknife, NT X1A 2P7

Permit No: 5688
Region: NS

Species: All wildlife
Location: Kwets'ootł'àà candidate protected area, near the north arm of Great Slave Lakeand Behchokò

Ecological assessment of the north arm candidate protected area

The north arm of Great Slave Lake is a candidate protected area under the NWT Protected Areas Strategy and the Federal "Completing Conservation Planning in the NWT" initiative.

Lizotte, Adrian
Aurora College – Environment and Natural Resources
PO Box 801
Fort Smith, NT X0E 0P0

Permit No: 5624
Region: NS, SS

Species: Marten
Location: Near Fort Smith and Bliss Lake

A comparative study of marten of the North and South Slave regions

Carcass samples were collected 20 miles southwest of Fort Smith, from traditional trappers, as well as the Bliss Lake Trapper Training Program in the Yellowknife area. Carcass weights, lengths and widths were compared by applying the (statistically based) 'T' test. The results indicated that there was not a significant difference in size from one region to another. The x^2 (Yates) formula was applied to determine if there is a significant difference in populations. Although sample sizes were limited, these results showed no significant difference between the North and South Slave marten populations.

Moore, Steve
EBA Engineering Consultants
Box 2244
#201, 4916-49th Street
Yellowknife, NT X1A 2P7

Permit No: 7417
Region: IN

Species: Gull species; ravens;
Location: Tuktoyaktuk

Tuktoyaktuk wind farm bird monitoring project

Collection of bird information, in support of future anticipated environmental assessment and regulatory permitting requirements.

Mulders, Robert
GNWT Department of Environment and Natural Resources
600, 5102 50th Avenue
Yellowknife, NT X1A 2L9

Permit No: 5686
Region: NS

Species: Wolverine
Location: Areas surrounding Daring Lake, Ekati Diamond Mine, Diavik Diamond Mine and Kennady Lake Mine

Wolverine DNA sampling on the central barrens

Wolverine hair snagging was completed in April 2010, within the BHP Diamond Mine, Diavik Diamond Mine and Daring Lake regional study areas. Wolverine hair samples were recently submitted to a genetics laboratory in British Columbia, with analysis expected to be completed by late October 2011.

Mulders, Robert
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PO Box 1320
Yellowknife, NT X1A 2L9

Permit No: 5625
Region: NS, SS, IN, GW, DC, SA

Species: Wolverine
Location: All NWT

NWT wolverine carcass collection

One hundred and ten wolverine carcasses were sampled from the Sahtu, Dehcho, South Slave and North Slave regions. This sample size is down from 130 examined last year. Tissue analysis (i.e. tooth aging and analysis of stomach contents) will be carried out in the months ahead and a comprehensive analysis of the necropsy data will be conducted in late 2011.

Panayi, Damian
Golder Associates Limited
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Yellowknife, NT X1A 3S3

Permit No: 5685

Species: All wildlife

Region: SS **Location:** near Kennady Lake and Łútsę̀lk'é

Gahcho Kue environmental monitoring March and April surveys

Wolverine presence and distribution within the study area were recorded using snow track surveys along 50 transects, 4 km in length, placed throughout the study area. The location, direction and number of tracks found were recorded.

Historic wolf den surveys, within the study area, were completed by helicopter in June and July, to determine den occupancy and productivity. Grizzly and black bear presence and distribution in the study area were determined using hair-snagging techniques. Approximately 40 hair-snagging posts were deployed throughout the study area. The posts were checked three times over the summer to autumn period, and all hair samples collected were recovered and archived.

In June, all waterbirds observed during a helicopter survey of the perimeter of Kennady Lake (46.9 km) were recorded, including the species, location and number of drakes and hens. Helicopter surveys were completed in June, to determine the number of raptors (i.e., peregrine falcon, gyrfalcon, rough-legged hawk, golden eagle) nesting in the study area. In July, nests were examined for chicks by flying the helicopter parallel to the cliff and counting the number of adults, eggs, and chicks present.

Poole, Kim

Aurora Wildlife Research
1918 Shannon Point Road
Neson, BC V1 L 6K1

Permit No: 5698 **Species:** Ungulates
Region: NS **Location:** Contwoyto Lake, near the proposed Izok mine site and Lupin mine site

MMG Resources Inc. Izok project, wildlife and wildlife habitat baseline studies

The August survey was based out of Lupin. Survey conditions were good. Twenty-seven caribou and one group of 26 muskoxen (four calves) were observed during the survey, as well as one wolf and one grizzly bear. Caribou were observed primarily west of Izok camp and were likely from the Bluenose-East herd.

The September ungulate survey was based out of Lupin. Survey conditions were again good, with variable light snow cover (0-25%). Approximately 1,100 caribou were observed, primarily near and west-northwest of Lupin. According to satellite collar data, these were most likely Bathurst caribou. Group sizes were estimated at up to 200, with a mixture of cows, calves and bulls. Two groups of muskoxen were observed with 62 animals (four calves; north of Izok camp) and 23 animals (no calves; north-northwest of Lupin) in each group. In addition, one grizzly bear and three single wolves were observed. The single bears observed during August and September surveys were likely different individuals, based on colouration.

Popko, Richard

GNWT Department of Environment and Natural Resources
PO Box 130
Norman Wells, NT X0E 0V0

Permit No: 5156 **Species:** Ducks

Region: SA **Location:** Willow Lake near Tulıt'a

Western Canada cooperative duck banding program at Willow Lake, Sahtu Settlement Area, Northwest Territories

Dabbling ducks are migratory waterfowl that are hunted throughout their range. Banding large numbers of ducks across their summer range before the start of the hunting season, and then documenting band returns from successful hunters, allows us to plot the harvest distribution.

Pretzlaw, Troy
Yukon Government
PO Box 194 (V5R)
Watson Lake, NT Y0A 1C0

Permit No: 5027 **Species:** All wildlife
Region: DC **Location:** west of Fort Liard

Muskwa Plateau and Beaver River wildlife inventory

The study area coincided with the Muskwa Plateau ecosystem, which includes portions of the Yukon, Northwest Territories and British Columbia. The survey was carried out March 22 and 23, 2010. Weather conditions allowed for good visibility for observing animals and tracks. Due to a combination of low ungulate densities, limited survey intensity and a possible lack of some species, moose was the only wildlife observed during the survey. A single bison carcass was discovered within the study area. Moose and bison tracks were also identified and recorded within the study area.

No observations of boreal caribou or elk, and no observations of caribou or elk tracks, does not preclude their presence in this area. The low search intensity indicated that there was no significant use or movement of boreal caribou, elk or bison through this area in late winter. However, more resources and alternate methodologies would be required to draw conclusions about the overall importance of this area to boreal caribou, elk and bison.

Rausch, Jennie
Canadian Wildlife Service
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Yellowknife, NT X1A 1T5

Permit No: 7414 **Species:** Shorebirds
Region: IN **Location:** Taglu, Fish Island, and Kendall Island Bird Sanctuary

Shorebird surveys in the Mackenzie Delta, Northwest Territories

A total of 41 shorebird nests were found on Taglu, Fish and Niglintgak Islands. A total of 33 adults and 59 juveniles were banded. The majority of nests were found outside of intensive survey plots, with only four shorebird nests found within the six intensively surveyed plots. In previous years, pectoral sandpipers have been prevalent on Taglu and Fish Island plots; however, this year they were absent. Pectoral sandpipers can change breeding sites from year to year, so that may explain the lack of nests in 2010. More long-billed dowitcher nests (n=4) were found this year than in previous years. This species is typically elusive and there are rarely more than one or two nests in a given year.

Reimer, Kenneth
Royal Military College of Canada
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Kingston, ON K7K 7B4

Permit No: 5691
Region: NS

Species: Hare
Location: Giant Mine, Con Mine, and near the Ingraham trail northeast of Yellowknife

Speciation and concentration of arsenic in hare inhabiting the North Slave Region
The concentration of total arsenic in muscle tissue in hare from contaminated sites (430-1720 μg/kg wet weight) ranged from 6.2-25 times the concentration of total arsenic in hare captured at the background site (69 μg/kg wet weight), near the Ingraham trail. Non-toxic arsenobetaine (AsB) was not found in any of the hares analysed. This is significant, because it confirms our hypothesis that hares obtain arsenobetaine via food, since our hypothesized source of arsenobetaine (mushrooms) were out of season in June 2010. The major arsenic species identified in the hare tissue analyzed thus far (muscle, kidney and liver) is the relatively non toxic arsenical dimethylarsinous acid. The minor arsenic species identified in the hare tissues are monomethylarsonous acid, arsenite, arsenocholine and trimethylarsine oxide. The extraction efficiencies range from approximately 58-70%; therefore, 30-40% of the arsenic species in each sample are unidentified. The research team will attempt to identify these unextracted species using synchrotron radiation in 2011.

Stomach contents and hare dietary items (plants) will be analyzed for total arsenic and arsenic species in 2011, and bioaccessibility extractions are currently being conducted (May 2011). Two papers from this project will be published, which cover the following topics: i) the arsenic species found in the hare tissues, as it relates to the hare diet; and ii) the bioaccessibility of arsenic compounds in the hare tissue. This information can be used to extrapolate results from the Yellowknife hare project to future projects involving country food consumption and associated risk.

Richardson, Evan
Environment Canada
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Edmonton, AB T6H 3S5

Permit No: 7409
Region: IN

Species: Polar bears
Location: Between Herschel Island and Cape Dalhousie on the Tuktoyaktuk Peninsula

Assessment of possible impacts of oil and gas activities on polar bears in the outer Mackenzie Delta and nearshore southern Beaufort Delta
During the aerial surveys in the spring of 2010, there were no new polar bear maternity den sites located in the Inuvialuit Settlement Region. Previously located den sites have been used to create a landscape level model that identifies the distribution of suitable polar bear maternity denning habitat in the Mackenzie Delta. A final report on this study will be produced in December 2011.

Robertson, Myra
Canadian Wildlife Service
Box 2310

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Permit No: 5689
Region: NS
Species: Waterfowl and other aquatic birds
Location: near Yellowknife

Abundance and productivity of waterfowl and other aquatic birds breeding in the boreal forest

The number of wigeon and bufflehead pairs were similar to the long-term average, while fewer pairs of lesser scaup, mallard and green-winged teal were observed in 2010. Observations of ring-necked duck have steadily increased over the past 26 years, and the number of pairs was once again well above the long-term average.

Duckling production was average for lesser scaup in 2010. Bufflehead and mallard production was slightly above average, and green-winged teal and wigeon production was slightly below average. The number of horned grebe pairs and young observed in the Yellowknife Study Area (YKSA) was slightly below average in 2010, indicating poorer than average production. Red-necked grebe pair numbers were slightly above average, with a very high number of young observed, indicating good production in 2010.

The western population of horned grebe was recently assessed to be of Special Concern by the Committee on the Status of Endangered Wildlife in Canada. Data from this work was incorporated into their assessment. The report can be accessed online at http://www.sararegistry.gc.ca/virtual_sara/files/cosewic/sr_horned_grebe_0809_e.pdf. Annual summary reports will be sent to regional contacts with our wildlife research permit applications. A document summarizing data and trends in the YKSA is in progress, and will be completed in the near future.

Robertson, Myra
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Permit No: 7418
Region: IN
Species: Geese and swans
Location: Mackenzie Delta, Tuktoyaktuk Peninsula and Anderson River

Population management of geese and swans in the Inuvialuit Settlement Region using aerial surveys and banding studies

Helicopter surveys were not conducted this year at either the Kendall Island and Anderson River snow goose colonies. In the future, these surveys will be conducted at three year intervals, to determine the colony size at each location, as long as the total number of adults remains above a set threshold. A decrease in the number of adults would warrant possible further management actions.

In July 2010, 1143 whitefronted geese, 2 white-fronted/snow goose hybrids and 24 Canada/cackling geese were banded in the Mackenzie Delta, Tuktoyaktuk Peninsula and Anderson River. In addition, 23 whitefronted geese that were banded in previous years were recaptured.

Band recoveries from banding efforts show there has been a recent eastward shift in the winter distributions of white-fronted geese from the Western Arctic. A higher proportion of geese were recovered in Louisiana and the Mississippi Alluvial Valley in Arkansas in recent years. Annual summary reports will be sent to regional contacts with our wildlife research permit applications.

Russell, Kyle
GNWT Department of Environment and Natural Resources
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Inuvik, NT X0E 0T0

Permit No: 7416
Region: GW, IN
Species: Dall's sheep
Location: Richardson Mountains

Dall's sheep aerial survey in the Richardson Mountains

Survey blocks were successfully flown this year, though there were some setbacks due to weather. In total, 700 sheep were observed. Of this, 549 were adult sheep, 150 were lambs and one sheep was unclassified. Of the adult sheep, 384 were nursery and 165 were rams.

Schmutz, Joel
United States Geological Survey
Alaska Science Center
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Anchorage, AK, USA 99508

Permit No: 5695
Region: NS
Species: Yellow-billed loons
Location: Daring Lake

Delineation of populations and migratory pathways of yellow-billed loons

During 9-16 July 2010, 15 yellow-billed loons were captured from a total of nine nest sites. Both males and females were captured at six nest sites. Seven of the nine nest sites failed to hatch young.

During our last visit to capture sites, adults from the two sites with hatched young were observed with young that were approximately six weeks old. Marked loons departed the Daring Lake area between 20 September and 23 October, and as of 29 November 2010, all 15 loons were alive and providing data from their current wintering habitats along the Pacific coastline. Most (nine individuals) migrated to the Hecate Strait area of northwest British Columbia. The remainder wintered in southern Alaskan waters, as far west as the south central Alaska Peninsula. Fourteen of 15 individuals migrated overland in a southwesterly direction from Daring Lake. Only one marked loon migrated north to the Coronation Gulf (south of Victoria Island), and then migrated west and followed the entire northern and western Alaska coastlines until arriving near Kodiak Island. This individual wintered in close proximity to two other marked loons that chose the alternate southwesterly, overland migration.

In comparison to yellow-billed loons marked in Alaska, these loons were smaller in body size, initiated fall migration later and wintered to the east. The most westerly of the Daring Lake loons wintered a bit east of the eastern-most location of all loons marked previously in Alaska. It is suspected that most loons wintering in southeast Alaska and British Columbia are from Canadian breeding grounds, whereas

Alaskan breeders winter in Asia or southwest Alaskan waters. Results of mercury analyses are still pending.

Wortham, Jim

US Fish & Wildlife
CWS, Environment Canada
Yellowknife, NT X1A 2P7

Permit No: 5754
Region: DC, SA, GW, IN
Species: Waterfowl
Location: Mackenzie Valley, from the southern border of the NWT to the Mackenzie Delta region

Cooperative waterfowl population surveys in the Northwest Territories

The entire survey area experienced an earlier-than normal break-up and early spring. In sharp contrast to the 2009 late spring, the majority of habitats were ice-free for arriving waterfowl. Good waterfowl production was predicted across most of this region. Overall, breeding waterfowl habitat conditions in the Northwest Territories were rated as "fair" in the southernmost survey portion to "good" for the majority of the survey area.

The 2010 total breeding duck estimate in central and northern Alberta, northeastern British Columbia, and the Northwest Territories was 26% higher than in 2009, and 23% above the long-term average (1955-2009).

Counts of mallards were 32% higher than in 2009, and 33% higher than the long-term average. The American wigeon estimate was similar to 2009 and 34% lower than the long-term average. Green-winged teal counts were similar to 2009 and 90% above the long-term average. Gadwall, blue-winged teal, northern shoveler, northern pintail, redhead, and canvasback estimates were all similar to 2009 and their long-term averages. The scaup estimate was 41% higher than in 2009, but similar to the long-term average.

The 2010 Waterfowl Population Status report can be accessed online at:
http://www.fws.gov/migratorybirds/NewReportsPublications/PopulationStatus/Waterfowl/StatusReport2010_Final.pdf

Photo Credit: Joost Van Der Sanden, Natural Resources Canada

Glossary

Abiotic – Not living

Active layer -The area where the soil continually freezes and thaws above the permafrost

Adaptation - A process by which a living organism (human, animal or plant) changes to become better suited to a new environment. This generally on an evolutionary timescale however, in the human context, it may be over a short period.

Adipose - Of, relating to, or composed of animal fat; fatty

Aerial - In the air

Aeromagnetic survey - Surveys from aircraft that make use of the magnetic field caused by magnetized rocks in the Earth's crust to make estimates about underlying geology of a given area such as distribution of potential resources

Algae - Simple living aquatic single or multi celled plant organisms that contains chlorophyll

Algorithm - A procedure or formula for solving a problem

Alkali - A basic substance that can range in strength

Analytical - A detailed examination of the structure or some other parameter of a substance or thing

Anoxic - A situation where oxygen is present in very low amounts or not at all, common in water

Annual - Occurs every year

Anthropogenic - Caused by a human action

Anthropology - The study of the human beings including their origins, cultures, evolution

Aquatic - Of water

Aquatic Biota - All living organisms in the aquatic environment

Arable - Land fit to be cultivated

Archaeology - The study of past human life and culture by looking at remains and artifacts like tools

Archean - A period of geologic time from about 3.9 billion years to 2.5 billion years ago

Archival - Pertaining to a collection of documents, normal over long periods of time

Arsenic - A chemical element that is gray in color and that is highly poisonous with no taste

Artifact - A historical tool, weapon or other human-made object that can be studied

Asexual - An organism that reproduces without the aid of a partner and who passes on all of its genetic information

Atmosphere - The layers of gases that surround and protect the Earth

Attributed - To explain by indicating a cause

Avifauna - the birds of a particular region or period

Bacteria - A large and varied group of single-celled microorganisms

Baseline - A set of information and data serving as a basis for comparison into the future

Bathymetry - Underwater topography. Mapping the underwater contours of the bottoms of water bodies

Beaufort Gyre - The major ice and ocean current circulation of the Arctic Ocean

Benthos - The bottom of the ocean or body of water

Biochemistry - The study of chemical processes in living organisms

Biodiversity - Pertaining to the variety of species in an area

Biogenic - Produced by living organisms or biological processes

Biogeography – The study of the geographical distribution of organisms

Biomass - The total amount of all living material within a specific volume of the environment

Biomes - Distinct areas of the Earth that are common in climate conditions, life forms and physical features like the tundra or woodland

Biostratigraphy - Identification and differentiation of rocks based on the types of fossils they contain

Biotic - Having to do with living organisms

Boreal - Relating to the forest areas of the Northern Temperate Zone that are dominated by coniferous trees such as spruce, fir and pine

Brachiopods - Any of various marine invertebrates of the phylum Brachiopoda, having bivalve dorsal and ventral shells enclosing a pair of tentacled, armlike structures that are used to sweep minute food particles into the mouth. Also called *lampshell*.

Breccia - Rock composed of sharp-angled fragments embedded in a fine-grained matrix

Brunisol Soil - soil type that is associated with forest vegetation. It is usually poorly developed and immature

Carbon^{14} – A radioactive isotope of carbon used to date ancient rocks and artifacts

Carnivore - A flesh/meat eating animal

Characterized - To describe an object or idea

Chlorophyll A - A pigment in plants that give them their green color and which absorb energy from the sun. Plants use Chlorophyll to change carbon dioxide and water into food and oxygen

Classification - Organize into groups or categories

Climate – Typical weather patterns of a region over long time periods

Community - All organisms in a particular environment

Comprehend - Being able to understand

Comprehensive - Conveying or including everything or almost everything

Coniferous woodland - A wooded area that is dominated by evergreen trees

Conifers - A group of woody plant commonly known as evergreen trees such as pine, spruce or fir that bears cones

Connectivity - As something is able to connect or relate with another thing

Core - A part removed from the interior of a mass especially to determine the interior composition

Correlated - A mutual relation between two comparable things

Cretaceous - Of or belonging to the geologic time, system of rocks and sedimentary deposits of the third and last period of the Mesozoic Era, characterized by the development of flowering plants and ending with the sudden extinction of the dinosaurs and many other forms of life

Crustacean - any mainly aquatic arthropod usually having a segmented body and chitinous exoskeleton

Cryosols - Cryosols are characterized by frozen soil within 1 metre (39 inches) of the land surface and by waterlogging during periods of thaw. They often show disrupted soil layers, cracks, or patterned surface features such as frost mounds, caused by the physical actions of ice formation and melting. Cryosols may be either mineral soils or humus-rich materials

Cryosphere - frozen water in the form of snow, permanently frozen ground (permafrost), floating ice and glaciers

Cumulative - Objects or ideas that add together

Cyanobacteria - predominantly photosynthetic prokaryotic organisms containing a blue pigment in addition to chlorophyll; occur singly or in colonies in diverse habitats; important as phytoplankton

Deciduous – A plant that lose their leaves during one season, usually winter

Deducing – To draw a conclusion

Deformation - A measurable change in structure, normally for the worse

Degradation - To reduce something or to place something at a lower level

Delta – The land formed where a river deposited silt as it enters into a larger water body, classic example, the Mackenzie Delta

Dendrochronology - A system of dating wooden objects by studying the tree growth rings

Density - A quantity of mass per unit volume

Devonian - Of or belonging to the geologic time, system of rocks, or sedimentary deposits of the fourth period of the Paleozoic Era, characterized by the development of lobe-finned fishes, the appearance of amphibians and insects and the first forests

Discontinuous – Not continuing or linked

Diurnal - Relating to or occurring in a 24-hour period; daily. Occurring or active during the daytime rather than at night

Diversion - A changing of the direction an object is going

Ecology - The science that deals with how living organisms live in relation to each other and their environment

Ecological integrity - Ensuring the relationship in plant and animal communities remains healthy

Ecosystem – The organisms present in a defined area and how they interact with the non-living surrounding (the biotic and the abiotic)

Effluent - A pollutant that flows out from a main source, such as sewage or waste matter

Ekman Grab - A box core type of sediment sampling device.

ELC data - Ecological Land Classification data

Electrofishing - Using electricity to stun and kill fish, usually used during scientific scenarios

Electromagnetic - Magnetism that is caused by electricity

Emissions - A water product that is radiated outward or discharged from a source

Endocrine – 1) designating or of any gland producing one or more hormones 2) designating or of such a hormone

Endophyte - An organism, especially a fungus or microorganism, that lives inside a plant, in a parasitic or mutualistic relationship

Environment – An organism's physical surroundings

Epoch - A period of time during which something important developed or happened

Erosion - Group of natural processes (weathering, disintegration, abrasion, corrosion, transportation) where the Earth's surface is worn away and removed

Eskers - A long, narrow ridge of coarse gravel deposited by a stream flowing under a decaying glacial sheet of ice

Estuary - A place where coastal seawater comes into contact with the current of a freshwater stream

Eukaryote - any member of the *Eukarya*, a domain of organisms having cells each with a distinct nucleus within which the genetic material is contained. Eukaryotes include protoctists, fungi, plants and animals

Eutrophication – The enrichment of aquatic systems, promoting dense algal and plant growth in a body of water, depriving the water of oxygen and forcing change in species composition

Evaporites A sedimentary deposit that results from the evaporation of seawater

Evolution - A process where different species come into existence by differentiation and genetic mutations from common ancestors over a long period of time.

Excavated - Extracting or revealing something by removal of the surrounding earth

Fauna - Animal life of a particular region, environment, or geological period

Fault - A fracture in a rock along which the rocks move; the place of origination of seismic activity; types include: strike-slip and thrust

Fecundity - Ability to reproduce

Fen - Low, flat, swampy land; a bog or marsh

Flora - The plants of a particular region, environment or geological region

Fluvial - Pertaining to something's existence or growth around a stream or river

Fossil -Trace of an organism of a past age, embedded and preserved in the Earth's crust

Fry – Infant fish

Fungi - A kingdom of heterotrophic organisms that produce spores

Fyke - A long, bag-shaped fishing net held open by hoops

Gas hydrates (clathrates) – Crystalline water based solids physically resembling ice, in which small non polar molecules (typically gases) are trapped inside "cages" of hydrogen bonded water molecules

Gender - One's characteristics or traits determined socially as a result of one's sex

Genetic - Pertaining to an organism's traits or characters being linked to genes

Genera - A group of organisms that share common characteristics

Geochemistry - The science that deals with the chemical composition of and chemical changes in the solid matter of the Earth

Geochronological - The chronology of the earth's history as determined by geologic events and not by human history

Geomorphologic - Pertaining to the physical features of the Earth's surface

Glauconite - A greenish mineral of the mica group, a hydrous silicate of potassium, iron, aluminum, or magnesium

Gonad - a gland in which gametes (sex cells) are produced

Grams (g) - A unit of measurement for mass

Habitat - A place where organisms live

Hepatic – (Anatomy) of or relating to the liver; (Botany) *botany* of or relating to the liverworts

Heterogeneous - A situation where something is in a mixed composition

Holocene - The most recent 11,000 years of the Earth's history starting at the end of the last major iceage, which has been relatively warm

Hydraulic - Pertaining to movement caused by water

Hydroacoustic survey - An echo-sounding (SONAR) survey used for measuring such things as fish stocks, water velocity, etc.

Hydrocarbon – A molecule containing hydrogen and carbon, often petroleum, natural gas and coal

Hydrograph - A graph showing the water level, discharge, or other property of river volume with respect to time

Hydrology - Science dealing with the properties, distribution and circulation of water

Isotope - Atoms that have nuclei with the same number of protons (as the atomic number) but different numbers of neutrons

Igneous - A rock or mineral that solidified from molten or partly molten material, i.e. from magma; one of three rock types with metamorphic and sedimentary

Implement - To put into effect

Iron - A metallic element used for making tools and essential for all living organisms' survival

Jarosite - a yellow to brown secondary mineral consisting of basic hydrated sulphate of iron and potassium in masses or hexagonal crystals

Kimberlite – An igneous that forms in volcanic pipe, an indicator of diamond deposits

Larvae - A premature stage for an insect where it feeds before becoming a pupa

Latitude - A measurement of the from the equator to a given point on the Earth's surface in the north and south direction

Laurentide Ice Sheet - Principal glacial cover of North America during the Pleistocene Epoch (2.6 million – 11,700 years ago). At its maximum extent it spread as far south as latitude 37° N and covered an area of more than 5 million sq mi (13 million sq km). In some areas its thickness reached 8,000 – 10,000 ft (2,400 – 3,000 m) or more

Ligotrophic (oligotrophic) - The opposite of eutrophic. Waters having very low levels of primary productivity and (usually) low concentrations of nutrients; good, clear water quality

Limestone - A sedimentary rock that contains mostly calcium carbonate and can be formed by either inorganic or organic processes

Limnology - The scientific study of the life and phenomena of fresh water, especially lakes and ponds

Lithic - Of, like, or made of stone. Archaeological artifacts made of stone

Meristic - Having or composed of segments; segmented

Mesic - Of, characterized by, or adapted to a moderately moist habitat

Metabolism - The chemical processes occurring within a living cell or organism that are necessary for the maintenance of life. In metabolism some substances are broken down to yield energy for vital processes while other substances, necessary for life, are synthesized

Metamorphic rock - Any rock derived from pre-existing rocks by changes in response to environmental factors such as temperature and pressure over a long period of time; one of three types of rocks with igneous and sedimentary

Methane - The simplest hydrocarbon that is the main ingredient in natural gas (CH_4)

Microclimate - The climate of a small area that is different due to changes in geography

Microorganisms - Organisms that must be viewed under a microscope, such as bacteria or a virus

Migration - The long range movement of a group of animals based on the seasons

Molecular analysis - A detailed look at the chemical structure and properties of a molecule

Moraine - A mound of rock debris carried and deposited by a glacier

Multicellular – Composed of more than one cell

Nutrient – Any chemical that an organism removes from the environment to aid with growth and development; common nutrients include nitrogen and phosphorus

Otolith – A part of a fish's inner ear, often used to determine the age fish

Organic - Material pertaining to plants or animals

Outcrop - A portion of bedrock or other stratum protruding through the soil level

Overlie - Sedimentary or volcanic rock that lies on top of older rock

Paleoecological - A relationship or study of ancient organisms and how they related to their ancient environment

Paleoenvironmental - An environment that existed in the past

Parr - a juvenile fish

Parameter - One set of measurable factors, such as the temperature and pressure that define a system and determine its behavior and are varied in an experiment

Pelagic - Relating to or living in or on oceanic waters. The pelagic zone of the ocean begins at the low tide mark and includes the entire oceanic water column

Permafrost – The permanently frozen layer of soil that characterizes the Arctic's ground; there are two various types: continuous and discontinuous

Pertinent – An object, idea or concept that is relevant to the topic

Phylogeography - the study of the historical processes that may be responsible for the contemporary geographic distributions of individuals

Phylum – (Biology) a major taxonomic division of living organisms that contain one or more classes. An example is the phylum *Arthropoda* (insects, crustaceans, arachnids, etc., and myriapods)

Physiological - Pertaining to the physical structures and functions of living organisms

Phytoplankton - A group of plant-like plankton that all sea animals depend on either directly or indirectly

Pingo – A large frozen mound covered with vegetation in permafrost areas

Pleistocene - An age of notable ice ages and development of humans between 2,000,000 and 10,000 years ago

Postglacial - Relating to or occurring during the time following a glacial period

ppm – An abbreviation of parts per million

Precipitation – Water (in the form of rain, snow, hail, etc) falling from the atmosphere

Prokaryote - An organism of the kingdom Monera (or Prokaryotae), comprising the bacteria and cyanobacteria, characterized by the absence of a distinct, membrane-bound nucleus or membrane-bound organelles, and by DNA that is not organized into chromosomes. Also called *moneran*

Qualitative – A complete detailed descriptions usually taken from a small sample that allows for distinctions to be drawn from the data

Quantitative - Use of large amounts of data where statistics can be applied to interpret the data

Quaternary - Of or belonging to the geologic time, system of rocks, or sedimentary deposits of the second period of the Cenozoic Era, from the end of the Tertiary Period through the present, characterized by the appearance and development of humans and including the Pleistocene and Holocene epochs

Qiviuq - The soft downy undercoat of muskoxen

Radiocarbon dating - The determination of the approximate age of an ancient object, such as an archaeological specimen, by measuring the amount of carbon^{14} it contains

Raptor - A bird of prey such as an eagle, falcon or osprey

Regolith - The layer of loose rock resting on bedrock, constituting the surface of most land. Also called *mantle rock*

Regosol - a type of azonal soil consisting of unconsolidated material derived from freshly deposited alluvium or sands

Remote Sensing – A technique used to study locations using technology that does not require the researcher to be in the field

Revitalization - To give new life or vitality to something

Riffle – a) A rocky shoal or sandbar lying just below the surface of a waterway b) A stretch of choppy water caused by such a shoal or sandbar; a rapid

Satellite imagery - Computer images generated by a satellite which allow researchers to look at a specific area and monitor surface features such as vegetation

Sediment - Solid fragment material that occurs from the weathering of rocks. In water it is material that has settled from a state of suspension

Sedimentary rock - Rock derived from loose particles that have accumulated over time

Sedimentation - The process where small particles are moved and deposited to accumulate into layers

Seine - A large fishing net made to hang vertically in the water by weights at the lower edge and floats at the top

Seismic - Pertaining to vibrations in the Earth, both natural and induced

Shovel testing - A simple test where a sample of ground is taken by use of a shovel and examined

Species - A group of organisms that share common characteristics that group them together and also distinguish them from others

Stone flakes/chards - debris left over from a rock while making tools

Stratified - A system that is set up in layers or strata

Stratigraphic - Formation of rock where different layers can be picked out based on type and age of the rock

Subsidence - The shifting of the Earth's surface downwards (compared normally to sea-level)

Succession - A progressive change in the biological community as a result of a response from species to the changing environment

Surficial - Pertaining to something that is on the surface

Suspension - A situation where the medium is able to support the weight of the particles trapped inside it, example: silt in a river.

Symbioses – An interaction between two or more organisms that usually benefits both

Sympatric - Occupying the same or overlapping geographic areas without interbreeding. Used of populations of closely related species

Systematic - Done according to a plan

Taxonomy - The classification of organisms in an ordered system that indicates natural relationships

Thermokarst - Sinking holes, caves and underground drainage that are produced in regions with permafrost from melting of ground ice and settling of the remaining ground

Theodolite - a surveying instrument for measuring vertical and horizontal angles. Also called (in the US and Canada) ***transit***

Thermocline - Layer in a large body of water that sharply separates regions differing in temperature. An abrupt temperature gradient in a lake

Topography - A description of the surface of a given area

Trace metals - A metal that is not essential in the sample but is found in small quantities

Transect - An imaginary line across a surface where observations are made

Tributary - A stream or river which feeds into a larger body of water

Turbid - Stirred up material suspended in a medium leaving it unclear and opaque

Ungulate - Hoofed animals

Velocity - Rate of change of position; quickness of motion

Volatile - Unstable; a substance that easily vapourizes

Watershed - A region draining into a river, river system, or other body of water

Weather – Daily variable changes in temperature, precipitation, wind and other atmospheric conditions

Zooplankton - Microscopic animal organisms floating in water

210-Pb Method - is used to determine the accumulation rate of sediments in lakes, oceans and other water bodies. It is used for over a period of 100 - 200 years.

Index

- Addiction
  - Alcohol 75, 181, 239
  - Drugs 75, 187
- Aklavik 3, 4, 29, 32, 35, 36, 37, 38, 39, 40, 43, 45, 47, 49, 55, 58, 63, 69, 71, 72, 73, 77, 79, 80, 83, 84, 85, 99, 182, 183, 184, 191, 197, 214, 239, 248, 249, 254, 257, 258, 260, 263, 268
- Alaska..... 53, 106, 179, 180, 227, 229, 231, 289, 306, 322, 323
- Arctic Ocean. 49, 51, 53, 54, 136, 193, 194, 205, 208, 231, 286
- Arctic Red River 207
- Banks Island48, 70, 96, 101, 121, 123, 126, 127, 202, 227, 274, 310, 311, 312
- Beadwork 95
- Beaufort Sea .. 29, 40, 42, 45, 49, 50, 51, 60, 70, 79, 106, 109, 110, 111, 120, 123, 127, 133, 134, 136, 139, 140, 168, 191, 192, 194, 204, 205, 207, 215, 217, 218, 222, 230, 231, 232, 244, 249, 254, 257, 263, 286, 288, 289, 295, 302, 306, 320
- Benthic Community 10, 16, 43, 51, 139, 150, 151, 160, 163, 195, 282, 289, 296, 300, 304
- Birds 103, 104, 105, 112, 113, 114, 117, 119, 159, 305, 306, 308, 309, 312, 314, 315, 321
  - Blackbird 159, 314, 316
  - Ducks 110, 111, 173, 306, 312, 319
  - Kendall Island Bird Sanctuary 319
  - Loons 305, 323
  - Migratory Birds 33, 118
  - Raptors 103, 111, 305, 318
  - Shorebirds 111, 119
  - Songbirds 33, 112, 118, 306
  - Swan and Geese 121, 305, 314, 321, 322
  - Waterfowl104, 105, 111, 112, 113, 115, 117, 118, 121, 122, 159, 305, 312, 315, 319, 321, 323
- Boreal Forest 2, 3, 6, 12, 95, 105, 109, 114, 116, 117, 120, 135, 161, 261, 262, 268, 284, 306, 319, 321
- Boreholes 64
- Climate Change 35, 90
  - Adaptation 235, 248
  - Emissions 41, 194
- Community-based .. 39, 91, 93, 95, 99, 100, 138, 149, 150, 182, 184, 186, 211, 239, 240, 286, 287, 288
  - Capacity... 13, 19, 40, 73, 74, 77, 79, 88, 92, 150, 162, 185, 186, 212, 223, 241, 246, 249, 257, 303
- Contaminant 18, 19, 197
  - Arsenic... 11, 19, 20, 26, 157, 166, 171, 173, 174, 298, 301, 320
  - Lead23, 24, 29, 76, 100, 157, 162, 165, 170, 174, 191, 209, 256, 261, 262
  - Mercury 21, 22, 28, 43, 63, 133, 136, 154, 157, 158, 165, 168, 170, 174, 284, 287, 303, 323
- Contaminants
  - Remediation1, 19, 23, 26, 28, 165, 166, 172, 173, 174, 245, 272, 279, 289, 297
- Daring Lake Tundra Ecosystem Research Station...7, 24, 48, 119, 203, 206, 211, 307, 317, 322, 323
- Deh Cho 105, 106, 115, 116, 117
- Deline 65, 285
- Distance Early Warning (DEW) Line 279
- Education 7, 35, 37, 38, 75, 76, 78, 81, 84, 85, 90, 91, 92, 93, 97, 128, 155, 179, 182, 183, 188, 189, 239, 241, 244, 246, 251, 254, 257, 294
- Elders..35, 36, 75, 78, 81, 84, 89, 90, 93, 94, 96, 97, 98, 99, 101, 108, 123, 128, 129, 248, 258, 259, 261, 262, 264, 266
- Environmental Effects Monitoring 11
- Environmental Site Assessment... 19, 22, 23, 26, 28, 29, 164, 169, 170
- Fish ...2, 3, 6, 7, 8, 10, 11, 13, 16, 17, 21, 22, 25, 26, 33, 43, 51, 60, 83, 94, 124, 133, 134, 135, 136, 137, 138, 140, 143, 144, 145, 146, 147, 148, 149, 150, 151, 153, 154, 156, 157, 158, 160, 161, 162, 163, 167, 168, 173, 195, 199, 200, 201, 211, 213, 217, 236, 243, 258, 260, 267, 268, 276, 282, 283, 284, 285, 286, 287, 289, 292, 293, 294, 295, 296, 297, 298, 299, 300, 301, 302, 303, 304
  - Angling 2, 154, 162, 199
  - Electrofishing 145, 158, 160, 162, 213
  - Gill Nets 10, 25, 135, 137, 168, 286, 295
- Fish Species 2, 8, 13, 60, 134, 144, 145, 147, 148, 157, 158, 160, 200, 236, 284, 297, 299
  - Cisco 8, 11, 94, 141, 151, 157, 167, 282, 283, 284, 285, 286, 290, 293, 294, 295, 298, 300, 302, 303
  - Dolly Varden....137, 142, 143, 283, 291, 292, 294, 301
  - Grayling....2, 3, 13, 144, 145, 147, 153, 162, 291, 292, 293, 297
  - Lake Trout ..21, 25, 136, 140, 154, 157, 160, 161, 167, 284, 285, 290, 300
  - Pike 3, 8, 11, 17, 157, 167, 168, 236, 285
  - Sculpin 2, 3, 11, 13, 140, 146, 153, 158, 162, 283, 297
  - Stickleback 8, 11, 17, 158, 162, 236, 285, 302
  - Trout13, 21, 22, 25, 133, 140, 141, 146, 154, 157, 158, 160, 162, 167, 168, 282, 284, 290, 299, 300
- Fort Good Hope 59, 82, 88, 90, 156, 240, 246, 248
- Fort Liard.......8, 12, 15, 31, 73, 88, 93, 280, 306, 307, 319

Fort McPherson.. 3, 5, 40, 56, 57, 63, 66, 73, 81, 83, 85, 95, 98, 124, 198, 207, 211, 241, 254, 268

Fort Providence 15, 18, 73, 74, 88, 95, 103, 107, 190, 197, 312

Fort Resolution... 1, 9, 10, 15, 19, 21, 22, 23, 46, 57, 58, 86, 88, 114, 118, 167, 242, 259, 260, 265, 266, 267, 268, 285, 307, 314

Fort Simpson.... 8, 12, 15, 19, 21, 41, 54, 64, 66, 73, 80, 88, 115, 116, 117, 193, 208, 306, 307

Fort Smith. 1, 12, 15, 54, 73, 78, 80, 88, 95, 103, 104, 107, 114, 120, 161, 182, 190, 208, 276, 307, 314, 316

Gamètì....................199, 309

Geotechnical Investigation...............71, 124, 235

Glaciers....................45, 48, 195, 205

Great Bear Lake. 20, 25, 26, 27, 65, 89, 90, 136, 140, 141, 157, 158, 167, 173, 174, 198, 199, 240, 263, 271, 280, 285, 290

Great Slave Lake ... 2, 11, 21, 22, 28, 44, 58, 66, 67, 94, 129, 136, 137, 146, 149, 151, 167, 172, 190, 199, 219, 229, 242, 266, 276, 285, 286, 293, 294, 295, 300, 316

Gwich'in....................241

H. pylori....................37, 38, 184, 239

Hunters and Trappers 29, 55, 74, 83, 99, 144, 149, 265

Ice... 4, 10, 19, 22, 29, 42, 43, 44, 45, 49, 51, 52, 53, 55, 56, 57, 59, 60, 63, 64, 65, 68, 69, 71, 72, 101, 106, 111, 123, 125, 135, 136, 138, 146, 147, 151, 156, 163, 176, 177, 191, 192, 194, 195, 198, 199, 204, 205, 207, 217, 218, 221, 223, 225, 226, 230, 231, 232, 233, 236, 237, 245, 270, 274, 278, 286, 288, 323
    Breakup ... 53, 59, 69, 71, 72, 136, 207, 215, 230, 233, 237, 286, 323
    Ice jams....................53, 207
    Scour Holes....................29, 42, 69, 230

Indian and Northern Affairs Canada ...22, 23, 26, 27, 28, 55, 64, 99, 172, 209, 210, 214, 279, 289

Industrial Development....................44, 61, 218
    Diamond Mines .. 13, 20, 21, 24, 42, 67, 104, 111, 119, 135, 146, 147, 153, 162, 165, 194, 217, 227, 270, 282, 283, 296, 313, 317
    Oil & Gas....................29, 45, 55, 63, 99, 200, 225

Ingraham Trail....................235

International Polar Year 8, 90, 95, 228, 230, 261, 265

Inuit 75, 79, 90, 92, 100, 123, 124, 170, 179, 181, 183, 255, 260, 265, 272, 279

Inuvialuit....3, 4, 8, 36, 39, 40, 50, 55, 67, 74, 75, 79, 84, 92, 96, 98, 99, 101, 106, 110, 118, 120, 121, 125, 155, 179, 181, 183, 184, 197, 205, 228, 244, 246, 249, 250, 251, 252, 254, 258, 259, 261, 268, 271, 272, 274, 275, 279, 320, 321

Inuvik.....3, 4, 6, 8, 13, 14, 16, 17, 24, 29, 32, 33, 34, 36, 37, 40, 41, 43, 45, 47, 49, 52, 53, 54, 55, 58, 59, 60, 62, 63, 66, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 79, 80, 83, 85, 91, 95, 98, 99, 101, 106, 108, 109, 110, 112, 118, 120, 130, 133, 143, 144, 155, 158, 159, 161, 164, 169, 177, 181, 182, 183, 191, 192, 193, 196, 204, 208, 214, 215, 222, 229, 232, 233, 234, 237, 244, 246, 250, 254, 255, 256, 257, 260, 263, 268, 276, 277, 279, 282, 295, 299, 302, 305, 307, 309, 310, 312, 322

Jean Marie River....................15, 64, 88, 262

Lakes
    Water Level....................58, 175

Lichen....................14, 33, 41, 153, 315, 316

Linguistics....................97

Lithic scatters....................129, 277, 278

Mackenzie Delta3, 40, 45, 47, 49, 55, 58, 59, 60, 69, 79, 99, 110, 119, 120, 125, 130, 131, 164, 168, 170, 200, 201, 204, 210, 214, 215, 216, 217, 221, 224, 225, 230, 233, 242, 244, 249, 254, 257, 259, 276, 283, 307, 319, 320, 321, 322, 323

Mackenzie Gas Project..........3, 4, 116, 210, 289

Mackenzie River 21, 47, 51, 54, 71, 114, 122, 131, 139, 157, 168, 176, 177, 190, 193, 201, 207, 208, 215, 216, 233, 234, 307

Mammals ..29, 32, 42, 50, 51, 52, 105, 106, 115, 117, 118, 133, 148, 168, 201, 205, 215, 299, 306, 307, 313, 315
    Beaver....................115, 118, 280
    Beluga....................74, 150, 170, 295, 303
    Caribou. 32, 97, 98, 103, 104, 107, 108, 109, 113, 114, 120, 131, 206, 209, 222, 265, 308, 310, 313, 314, 318
    Grizzly Bear......32, 103, 104, 105, 110, 115, 118, 212, 217, 305, 310, 313, 318
    Moose 31, 32, 105, 113, 115, 116, 118, 159, 305, 308, 316, 319
    Muskrat....................112, 173
    Polar Bears.......51, 101, 105, 106, 109, 110, 120, 127, 170, 202, 254, 263, 310, 311, 320
    Wolf............24, 98, 107, 115, 212, 262, 310, 313, 318
    Wolverine 111, 118, 119, 217, 262, 313, 317
    Wood Bison....................103, 104, 107, 117, 319

Mars....................68

Melville Ice Cap 43, 56, 61, 126, 195, 213

Métis 39, 79, 84, 86, 88, 89, 90, 95, 96, 253, 260, 261, 262, 273

National Park
  Tuktut Nogait 5, 126

National Parks
  Nahanni 7, 8, 12, 13, 15, 31, 88, 107, 113, 117, 130, 273, 299, 313
  Wood Buffalo 12, 14, 103, 117, 120, 161, 234, 308

Natural gas 41, 45, 200, 211, 218, 235

Natural Gas 63

Norman Wells 1, 6, 23, 33, 41, 52, 59, 62, 66, 73, 80, 88, 90, 121, 153, 155, 156, 168, 193, 216, 224, 225, 240, 262, 278, 287, 307, 318

North Slave Métis Alliance 87, 95, 253, 266

Nunatsiavut 75

Nunavik 91, 255

Nunavut 24, 35, 43, 56, 75, 91, 125, 127, 179, 192, 202, 213, 244, 255

Nursing 35, 180, 183, 187, 188, 189

Nutrition 37, 182
  Traditional Foods 25, 92, 181, 239, 242, 250, 258, 320

Old Crow Flats 205

Organic contaminants 21, 136, 167, 285

Paleontology 48, 61, 66, 70, 200, 202, 203, 215

Paulatuk 5, 18, 29, 40, 43, 44, 49, 73, 75, 76, 91, 92, 100, 126, 142, 182, 183, 196, 197, 227, 246, 248, 249, 252, 254, 257, 260, 263, 264, 291

Permafrost 2, 29, 41, 42, 44, 45, 49, 54, 55, 57, 62, 63, 64, 66, 67, 71, 72, 99, 133, 156, 164, 196, 200, 204, 209, 210, 211, 212, 214, 217, 218, 223, 225, 226, 227, 228, 235, 236, 237, 249, 283, 304
  Active layer 41, 55, 67, 165, 226, 228, 235

Petroleum 28, 169, 191, 232

Phytoplankton 10, 16, 43, 72, 149, 163, 173, 195, 236, 282, 300

Pingo 29, 68

Plant Surveys
  Transects 48, 63, 106, 220, 224, 318

Pollutants 21, 303

Pregnancy 108, 109, 114, 185

Primary Health Care 185, 188, 189

Prince Patrick Island 169, 221, 227, 272

RADAR 53, 64, 71, 226, 229

Radiocarbon dating 48, 124, 198, 203

Rat River 142, 143, 205, 291, 292

Sachs Harbour 40, 43, 48, 52, 53, 56, 69, 70, 84, 96, 100, 101, 123, 127, 149, 150, 155, 182, 183, 203, 250, 252, 254, 260, 263, 286, 287

Sahtu 6, 31, 62, 67, 82, 88, 89, 90, 106, 121, 126, 140, 141, 155, 156, 157, 168, 169, 182, 199, 228, 246, 247, 252, 254, 262, 273, 278, 287, 290, 317, 319

Sexual Health 186

Shovel tests 124, 125, 129, 130, 273, 275, 281

Snow 43, 45, 48, 50, 55, 56, 58, 69, 71, 72, 108, 109, 121, 125, 166, 195, 203, 206, 207, 210, 223, 230, 233, 245, 248, 318, 321, 322

Social Work 73, 76, 181, 238

Streams 7, 10, 12, 13, 19, 46, 59, 64, 70, 131, 137, 142, 144, 145, 147, 149, 150, 156, 160, 162, 176, 200, 204, 210, 216, 226, 231, 274, 281, 293, 299
  Flow 64, 149, 176, 226

Sumps 55, 63, 99, 210, 225

Tlicho 27, 88, 97, 101, 102, 182, 186, 245, 252, 253, 270, 276, 278

Tobacco 38, 39, 78, 184

Traditional Knowledge 35, 36, 78, 81, 90, 94, 95, 96, 98, 99, 100, 101, 109, 130, 157, 258, 261, 262, 263, 266, 267, 268

Trees 2, 5, 6, 12, 14, 15, 33, 41, 64, 161, 190, 198, 210, 262, 273, 274, 277, 305
  Treeline 6, 14, 15, 114, 121, 204, 210, 308

Tsiigehtchic 3, 5, 40, 47, 54, 55, 58, 63, 66, 71, 85, 207, 208, 211, 268

Tuktoyaktuk 3, 4, 8, 14, 15, 16, 29, 32, 36, 37, 40, 41, 43, 45, 49, 51, 52, 55, 60, 62, 63, 66, 67, 68, 69, 72, 73, 74, 77, 78, 85, 99, 106, 110, 120, 125, 130, 140, 144, 155, 159, 182, 183, 191, 197, 201, 214, 222, 228, 246, 257, 260, 263, 265, 276, 299, 311, 312, 317, 320, 321, 322

Tulita 59, 123, 287

Ulukhaktok 263

Weather Station 43, 58, 176, 195, 213, 272

Wekweètì 232

Wetlands 18, 19, 20, 26, 159, 190, 197

Whitehorse 18, 33, 85, 113, 224, 263, 313

Wind Energy.......... 33, 34, 68, 70, 224, 232, 233

Yellowknife . 1, 2, 7, 9, 10, 11, 13, 15, 18, 20, 21, 22, 23, 25, 28, 31, 33, 34, 35, 36, 38, 39, 40, 42, 44, 46, 50, 52, 55, 57, 58, 59, 62, 63, 69, 70, 73, 74, 75, 76, 77, 78, 79, 80, 83, 85, 86, 87, 88, 89, 90, 94, 95, 97, 103, 104, 106, 107, 108, 111, 112, 113, 117, 118, 119, 121, 122, 125, 128, 134, 135, 138, 139, 145, 146, 147, 148, 151, 153, 154, 156, 157, 158, 159, 160, 161, 164, 171, 174, 175, 176, 179, 180, 181, 182, 183, 185, 186, 187, 188, 189, 190, 191, 194, 197, 199, 201, 209, 210, 213, 214, 216, 217, 219, 220, 222, 223, 227, 235, 238, 239, 240, 242, 243, 245, 247, 251, 253, 256, 261, 265, 267, 270, 273, 276, 277, 282, 283, 284, 286, 287, 288, 293, 294, 295, 296, 297, 298, 299, 301, 302, 307, 308, 309, 311, 313, 314, 315, 316, 317, 319, 320, 321, 323

Youth 7, 24, 35, 36, 39, 55, 75, 81, 82, 84, 89, 90, 93, 99, 155, 184, 242, 243, 248, 256, 259, 263, 264, 266

Yukon 5, 15, 54, 91, 113, 124, 155, 205, 208, 209, 255, 263, 301, 307, 313, 314, 319

Index of Authors

Aurora Research Institute
Scientific Research Licences

2009

Biology
Azzolini, Louie 1
Blaschuk, Katherine 1
Budziak, Jerry 1
Bunn, Andy 2
Cote, Jason 2
Darnell, David 3
Evans, Marlene 3
Evans, Marlene 4
Gillespie, Lynn 4
Green, Scott 5
Greene, David 5
Guthrie, Glen 6
Hamilton, David 6
Hoar, Bryanne 7
Hoos, Rick 8
Krizan, Julia 8
Lennie-Misgeld, Peter 8
Lennie-Misgeld, Peter 9
Lennie-Misgeld, Peter 10
Machtans, Hilary 10
Naeth, Anne 11
Osawa, Akira 11
Scrimgeour, Garry 12
Tonn, William 12
Trimble, Annika 13
Waddington, J.M. 13
Walker, Xanthe 14
Wallenius, Tuomo 14
Wen, Marc 15
Wrona, Frederick 16

Contaminants
ChallenUrbanic, Jane 17
Davidson, Scott 17
Diplock, David 18
Diplock, David 18
Drysdale, Jessica 19
English, Colleen 19
Evans, Marlene 20
Evans, Marlene 20
Farrell, Rory 21
Hadley, Katherine 21
Kanigan, Julian 22
Katz, Sharon 23
Macdonald, Colin 23
Robb, Tonia 24
Sealey, Heather 24
Wiatzka, Gerd 25
Wiatzka, Gerd 25
Winch, Susan 26
Wright, Greg 27
Ziervogel, Herb 27

Engineering
Koke, Paul 29
Koke, Paul 29
Maaskant, Shirley 30
Pinard, Jean-Paul 30
Thomas, Craig 31
Trimble, Annika 31

Health
Austin, Wendy 33
Chatwood, Susan 33
Cooper, Elizabeth 34
DeRoose, Elsie 34
Glacken, Jody 35
Goodman, Karen 35
Jardine, Cindy 36
Hall, Karen 36
Hammond, Merryl 37
Hoechsmann, Alexander 37
Smith, Jane 38

Physical Sciences
Bhatti, Jagtar 39
Blasco, Steve 39
Blowes, David 40
Bohnet, Seth 40
Burgess, David 41
Burn, Chris 41
Corriveau, Louise 42
Craven, Jim 42
Dallimore, Scott 43
Draho, Bob 43
Draho, Bob 44
Eglinton, Timothy 44
England, John 45
English, Michael 46
Ensom, Timothy 46
Fortier, Martin 47
Grogan, Paul 47
Hadow, Pen 48
Hawkins, James 49
Henton, Joseph 49
Herber, Andreas 50
Hicks, Faye 50
Hilton, Robert 51
Holmes, Robert 51
Kokelj, Steve 52
Lafleur, Peter 53
Lamoureux, Scott 53
Lauriol, Bernard 54
Lennie-Misgeld, Peter 54
Lennie-Misgeld, Peter 54
Lennie-Misgeld, Peter 55
Lesack, Lance 55
MacNaughton, Robert 56
MacNeill, Scott 56
Marsh, Philip 57
Maxwell, Erin 58
Miles, Warner 58
Neufeld, Lori 59
O'Neill, Norman 59
Pisaric, Michael 60
Pollard, Wayne 60
Quinton, William 61
Rainbird, Robert 61
Schertzer, William 62
Schneider, Christie 62
Smith, Sharon 63
Snyder, David 64
Soare, Richard 64
Sofko, George 65
Solomon, Steve 65
Spence, Christopher 66
Spencer, Lee 67
Trimble, Annika 67
van der Sanden, Josephus 67
Wang, Baolin 68
Wrona, Frederick 68
Wrona, Frederick 69

Social Sciences
Abele, Frances 70
Bassi Kellett, Sheila 70
Bell, Lindsay 71
Berkes, Fikret 71
Brunelle, Natacha 72
Bussey, Eric 72
Christensen, Julia 73
Haider, Wolfgang 73
Hoogeveen, Dawn 74
Irlbacher-Fox, Stephanie 74
Jacob, Victoria 74
Jardine, Cindy 75
Kikkert, Peter 75

Kolausok, Edwin 76
Lukas-Amulung, Sandra 77
Martin, Marissa 77
Nichol, Cynthia 78
Parlee, Brenda 78
Parlee, Brenda 79
Patton, Eva 79
Prosyk, Liisa 80
Rawluk, Andrea 80
Reinfort, Breanne 81
Robinson, Suzanne 81
Sabin, Jerald 82
Sandlos, John 83
Saxon, Leslie 83
Schurr, Theodore 84
Schurr, Theodore 84
Simmons, Deborah 85
Simmons, Deborah 86
Simmons, Deborah 86
Southcott, Chris 87
Taylor, Donald 88
Todd, Zoe 88

Traditional Knowkedge

Brook, Ryan 90
Capot-Blanc, Gilbert 90
Drygeese, Jennifer 91
Edge, Lois 91
Grieve, Sheryl 92
Hodgetts, Lisa 93
Jacobsen, Petter 93
Jaker, Alessandro 94
Katz, Sharon 94
Lam, Jennifer 95
Lyons, Natasha 96
Nickels, Scot 96
Ouellette, Nathalie 97
Slavik, Daniel 97
Welch, Nicholas 98

Prince of Wales Northern Heritage Centre

Archaeology

Andrews, Tom 99
Arnold, Charles 99
Benson, Kristi 100
Bussey, Jean 100
Clarke, Grant 101
Dueck, Lori 102
Gray, David 102
Hartery, Latonia 103
Lobb, Murray 103
MacKay, Glen 104
MacKay, Glen 104
Murphy, Brent 105
Prager, Gabriella 105
Prager, Gabriella 106
Youell, AlanBill, Kevin 107

Fisheries and Oceans Canada

Fisheries Permits

Bill, Kevin 108
Blais, Jules 108
Cobb, Donal 108
Cote, Jason 109
Cote, Jason 109
Cott, Peter 109
English, Colleen 110
Evans, Marlene 111
Fortier, Martin 111
Frame, Stacey 111
Frame, Stacey 112
Gallagher, Colin 112
Hamilton, David 112
Hamilton, David 113
Harwood, Lois 113
Harwood, Lois 113
Hawkins, Jim 114
Hoos, Richard 115
Howland, Kimberly 115
Howland, Kimberly 115
Howland, Kimberly 116
Howland, Kimberly 116
Howland, Kimberly 116
Howland, Kimberly 117
Howland, Kimberly 117
Kristensen, Kent 118
Krizan, Julia 118
Landry, Francois 119
Landry, Francois 119
Leonard, Deanna 120
Machtans, Hilary 120
McCallum, Dee 120
McPherson, Morag 121
Mochnacz, Neil 122
Mochnacz, Neil 122
Morantz, David 122
Nicol, Sandra 123
Reist, Jim 123
Stern, Gary 124
Tonn, William 124
Vecsei, Paul 124
Wrona, Fred 125

Department of Envorinment and Natural Resources

Wildlife

Abernethy, Dave 126
Armstrong, Terry 126
Armstrong, Terry 126
Armstrong, Terry 127
Arquilla, Brian 127
Bartlett, John 127
Bayne, Eric 128
Ben-David, Merav 128
Branigan, Marsha 129
Carriere, Suzanne 129
Cluff, Dean 129
Cox, Karl 130
Croft, Bruno 130
Croft, Bruno 130
Davison, Tracy 131
Davison, Tracy 131
Davison, Tracy 132
Derocher, Andy 132
Derocher, Andy 132
Dixon, Lynne 133
Elkin, Brett 133
English, Colleen 134
Fronczak, Dave 134
Grabke, Dan 134
Green, David 135
Haas, Claudia 135
Haas, Claudia 135
Hegel, Troy 136
Johns, Brian 136
Kelly, Allicia 136
Kelly, Allicia 137
Klimstra, Jon 137
Lambert Koizumi, C 137
Larter, Nic 137
Larter, Nic 138
Larter, Nic 138
Larter, Nic 139
Larter, Nic 139
Latour, Paul 139
Lennie-Misgeld, Peter 140
Maaskant, Shirley 140
Mulders, Robert 141
Mulders, Robert 141
Rausch, Jennie 141
Richardson, Evan 142

Schock, Danna 142
Scott, Adam 142
Veitch, Alasdair 143
Wood, Cindy 143
Wood, Cindy 143
Wortham, Jim 144

2010

Aurora Research Instute Scientific Research Licences

Biology

Blaschuk, Katherine 146
Bourn, Stephen 146
Cote, Jason E 146
Gillespie, Lynn J 147
Goulet, Henri 148
Guthrie, Glen H 148
Guthrie, Glen H 149
Lawson, Nick 149
Lennie-Misgeld, Peter 150
Macdonald, Colin 150
Machtans, Hilary 151
Maier, Kris 151
Moore, Steve 151
Moore, Steve M 152
Muir, Andrew M 153
Osawa, Akira 153
Panayi, Damian 154
Shapiro, Michael D 154
Tonn, William 155
Wen, Marc 155

Contaminants

Bandler, Paul 157
Blais, Jules M 157
Blowes, David 158
Bromstad, Mackenzie J 158
Budziak, Jerry 159
Evans, Marlene 159
Evans, Marlene 160
Graydon, Jennifer A 160
Guthrie, Glen 161
Krizan, Julia 161
Livingstone, Steve 162
Ostertag, Sonja K 163
Reimer, Kenneth J 163
Stephen, Celsian C 164
Wiatzka, Gerd M 164
Widmeyer, Joline 165
Zawacky, Summer R 166
Ziervogel, Herb 166

Engineering

Draho, Bob 168
Lawson, Nick 168
May, Glenn 169
Mutua, Daniel 169
Patterson, R. Tim 170

Health

Arbour, Laura 171
Benerji, Anna 171
Brennan, Jodi N 172
Case, Cheryl A 172
Chatwood, Susan 173
De Roose, Elsie C 173
Dobbins, Maureen 174
Egeland, Grace M 174
Geraghty, Ashley A 175
Goodman, Karen J 175
Hammond, Merryl 176
Hoechsmann, Alexander 176
Kandola, Kami 177
Martin, Jim L 177
Minuk, Gerald Y 178
Pontin, David 179
Rose, Louise 179
Simor, Andrew 180
Stanley-Young, Donna 180

Physical Sciences

Armstrong, Terry 182
Aubet, Natalie 182
Barker, Anne 183
Bédard, Jean H 184
Bhatti, Jagtar 184
Bogen, Jim J 185
Bottenheim, Jan W 185
Bourn, Stephen 186
Burgess, David 187
Burn, Chris 187
Butterfield, Nicholas J 187
Challen Urbanic, Jane 188
Chatwood, Susan 189
Clark, Ian D 189
Corriveau, Louise 190
Cote, Jason 190
Cumbaa, Stephen L 191
Dallimore, Scott R 191
Duffe, Jason A 192
Duthie, Andrew 192
Eberle, Jaelyn J 193
England, John 193
English, Michael C 194
Ensom, Timothy 195
Fortier, Martin 195
Froese, Duane G 196
Gilbert, Graham 196
Grogan, Paul 197
Hawkins, James R 197
Hicks, Faye E 198
Hilton, Robert 198
Holmes, Robert M 199
Kanigan, Julian 199
Kershaw, Peter 200
Kokelj, Steven V 200
Kokelj, Steve V 201
Kristensen, Kent J 202
Lafleur, Peter M 202
Lambert Koizumi, C 202
Lamoureux, Scott 203
Langhorne, Amy 203
Lantz, Trevor C 204
Lennie-Misgeld, Peter 205
Lesack, Lance 205
Longrich, Nicholas R 206
MacNaughton, Robert 206
Marsh, Philip 207
McCallum, Dee 207
Melling, Humfrey 208
Miles, Warner F 208
Milton, Jack E 209
Mitchell, Ross N 209
Mloszewski, Aleksandra 210
Moorman, Brian J 211
Mueller, Derek 211
Mumford, Thomas R 212
Noble, Bram F 212
O'Neill, Brendan H 213
O'Neill, Norman 213
Pickart, Robert S 214
Pinard, Jean-Paul 214
Pisaric, Michael 215
Pollard, Wayne H 215
Quinton, William 216
Reford, Stephen 217
Romanovsky, Vladimir E 217
Smith, Sharon 218
Snyder, David 218
Sofko, George 219
Solomon, Steven 219
Spence, Christopher 220
Steele, Michael 221
Sturm, Matthew 221
Tiffin, Scott 221

Trimble, Annika 222
Trimble, Annika 222
Trimble, Annika 223
van der Sanden, Josephus 223
Waddington, J.M 223
Wang, Zhaohui 'Aleck' 224
Wolfe, Stephen A 224
Worthy, Douglas 225
Wrona, Frederick J 225
Wrona, Frederick J 226
Wrona, Frederick J 226
Wrona, Frederick J 227

Social Sciences

Abele, Frances 228
Arberry, Saundra 228
Bresnahan, Andrew 229
Caine, Ken J 229
Cash, Penny 230
Closs, Renee T 230
Connell, Taig J. M 231
Duran, Nelida (Nellie) 231
Fresque, Jennifer 232
Giles, Audrey R 232
Graham, John R 233
Hodgkins, Andrew 234
Holzman, Sara 234
Jacobsen, Petter 234
Jardine, Cindy 235
Lyons, Natasha 236
Mak, Ida YL 236
McLafferty, Carly A 237
Mitchell, Ross E 237
Parlee, Brenda 237
Pearce, Tristan D 238
Pearce, Tristan D 239
Reinfort, Breanne 239
Robinson, Suzanne 240
Sarikaya, Suleyman 240
Schurr, Theodore 241
Schurr, Theodore 242
Schurr, Theodore 242
Simmons, Deborah 243
Slavik, Daniel 243
Smith, Jane 244
Southcott, Chris 244
Southcott, Chris 245
Speevak-Sladowski, Paula 245
Stuhl, Andrew T 246
Taylor, Donald 246

Traditional Knowledge

Archie, Billy 248
Bennett, Trevor 248
Borowitz, Michelle A 249
Douglas, Vasiliki K 249
Goodjohn, Mitchell T 250
Grieve, Sheryl 250
Hopkins, Chris 251
Ireland, Margaret 251
Maraj, Ramona 252
Oliver, Meryl 252
Parlee, Brenda L 253
Parlee, Brenda L 253
Parlee, Brenda L 254
Sandlos, John 254
Swisher, Sara 255
Swisher, Sara 256
Swisher, Sara 256
Thompson, Amy 257

Prince of Wales Norther Heritage Centre

Archaeology

Andrews, Tom 258
Bussey, Jean 258
Bussey, Jean 258
Cary, Henry 259
Cary, Henry 259
Clarke, Grant 260
Clarke, Grant 261
Dueck, Lori 261
Harris, Ryan 262
Hartery, Latonia 262
MacKay, Glen R 263
Novecosky, Brad 263
Novecosky, Brad 263
Prager, Gabriella 264
Prager, Gabriella 264
Prager, Gabriella 265
Prager, Gabriella 265
Seip, Lisa 266
Webster, Sean 267
Wickham, Michelle 267
Wickham, Michelle 268
Youell, Alan 268

Fisheries and Oceans Canada

Fisheries Permits

Ash, Jason 270
Bill, Kevin 270
Bilsaillon, Jean-Francois 270
Blais, Jules 271
Bourn, Stephen 271
Cote, Jason 271
Cott, Peter 272
Evans, Marlene 272
Evans, Marlene 273
Fortier, Martin 273
Frame, Stacey 273
Furgal, Christopher 274
Guthrie, Glen 274
Harwood, Lois 275
Harwood, Lois 275
Harwood, Lois 276
Holzapfel, Angela 276
Howland, Kimberly 277
Howland, Kimberly 277
Howland, Kimberly 278
Howland, Kimberly 278
Howland, Kimberly 279
Howland, Kimberly 279
Landry, Francois 280
Leonard, Deanna 280
Leonard, Deanna 281
Loseto, Lisa 281
Machants, Marla 282
Maier, Kris 282
Mason, Kristine 282
Mason, Kristine 283
McCallum, Dee 283
McPherson, Morag 283
McPherson, Morag 284
McPherson, Morag 284
Mochnacz, Neil 285
Mochnacz, Neil 285
Morantz, David 286
Muir, Andrew 286
Nicol, Sandra 286
Patershuk, Matt 287
Reimer, Ken 287
Reist, Jim 288
Shapiro, Michael 288
Sotiropolous, Maria 288
Stein, Terry 289
Stern, Gary 289
Tonn, William 289
Wrona, Fred 290

Department of Environment and Natural Resources

Wildlife

Bartzen, Blake	291
Bartzen, Blake	291
Bayne, Erin	292
Carriere, Suzanne	292
Carriere, Suzanne	293
Cluff, Dean	293
Coulton, Dan	293
Craig-Moore, Lea	294
Croft, Bruno	294
Croft, Bruno	295
Davidson, Tracy	295
Davison, Tracy	296
Decker, Robert	296
Derocher, Andy	296
Elkin, Brett	297
Fronczak, David	297
Green, David	297
Groves, Debbie	298
Hegel, Troy	298
Hood, Alexandra	298
Kardynal, Kevin	299
Kelly, Allicia	299
Klaczek, Mike	299
Klimstra, Jon	300
Langlois, Karla	300
Latour, Paul	301
Lizotte, Adrian	301
Moore, Steve	302
Mulders, Robert	302
Mulders, Robert	302
Panayi, Damian	302
Poole, Kim	303
Popko, Richard	303
Pretzlaw, Troy	304
Rausch, Jennie	304
Reimer, Kenneth	305
Richardson, Evan	305
Robertson, Myra	305
Robertson, Myra	306
Russell, Kyle	307
Schmutz, Joel	307
Wortham, Jim	308

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